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Bufo kisoloensi Loveridge and *Chamaeleo ituriensis* Schmidt Revived

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Some species, after being discovered and accurately described not infrequently become buried in the synonymy. My present investigations in Central Africa showed that such is the case for *Bufo kisoloensis* Loveridge and *Chamaeleo ituriensis* Schmidt.

Bufo kisoloensis Loveridge

Bufo regularis kisoloensis Loveridge, 1932, Occ. Papers Boston Soc. Nat. Hist., 8, p. 52 (Kisolo).

Bufo regularis regularis (not Reuss) Loveridge (part), 1942, Bull. Mus. Comp. Zool., 91, p. 385.

Knowing that *B. kisoloensis* was described by Loveridge as a race of *B. regularis,* and was later synonymized by its author with the typical race of *B. regularis,* it was a surprise indeed to discover that Loveridge's form is actually a valid species coexisting with *B. regularis.* In at least two localities (Astrida in the Ruanda, and Butembo in the North Kivu), two distinct species, both complying with the conventional definition of *regularis* live together. The larger one is apparently the true *regularis,* but quite possibly a race distinct from the typical Aegyptian populations; it may be noted parenthetically that the intraspecific variation of the commonest toad of Africa has never been worked out.

The smaller species is obviously *Bufo kisoloensis* Loveridge and as there is not the slightest appearance of hybridization between the two, they have to be considered as two distinct species.

Bufo regularis is sporadic in occurrence in the Kivu-Ruanda region and seems to be absent on the shores of the Lake Kivu, and in the region of the Kivu volcanoes. The greatest part of the *"Bufo regularis"* material collected by de Witte in the National Albert Park (1941, Expl. P.N.A., Miss de Witte, 33, p. 36) undoubtedly pertains to *Bufo kisoloensis* which is the common toad in this part of the Graben.

As preliminary remarks, I give here the differences observed, on the basis of living animals, between *Bufo regularis* and *Bufo kisoloensis* from Butembo.

Bufo regularis	*Bufo kisoloensis*
1. Larger.	1. Smaller.
2. Both sexes spotted, contrast between dark and pale areas moderate.	2. Female distinctly spotted, contrast between dark and pale markings quite conspicuous. Male yellow (mastic) or greenish, not or sparsely spotted.
3. Snout round, angle between the canthi equal to or greater than 90°.*	3. Snout more pointed, angle between the canthi less than 90°.
4. Throat of male infuscated.	4. Throat of male not infuscated.
5. Pairs of dorsal markings broader.	5. Pairs of dorsal markings narrower, especially the scapular ones.
6. Pale interorbital markings less distinct.	6. Pale interorbital markings conspicuous.
7. Dark spots behind this pale interorbital band, less distinct, band-like.	7. Dark spots behind this pale interorbital band well marked and triangular in shape.
8. Between these spots and the scapular spots, one pair of preparotid markings, sometimes fused with scapular ones.	8. Preparotid spots absent or minute.
9. Posttympanic marking generally not bordering tympanum above.	9. Posttympanic marking bordering tympanum above.
10. Lateral markings of marbled pattern, nearly always connected with dorsal spots.	10. Lateral markings band-like, more highly located on the flanks, never connected with dorsal spots.
11. Interparotid space at least as broad as a parotid gland.	11. Interparotid space at most as broad as parotid gland.
12. Toes shorter.	12. Toes longer.
13. External metatarsal tubercle stouter.	13. External metatarsal tubercle weaker
14. Subarticular and plantar tubercles weaker.	14. Subarticular and plantar tubercles stouter.
15. Dorsal warts more scattered.	15. Dorsal warts more numerous.
16. Thighs weakly warted.	16. Thighs heavily warted, the warts whiter than the background.
17. Posttympanic warts moderate.	17. Posttympanic warts stouter and more spinous.
18. Tympanum at least as far from eye as from angle of jaws.	18. Tympanum nearer eye than angle of jaws.
19. Lower jaw straight (seen from the side).	19. Lower jaw slightly curved downwards.
20. Lower jaws wider.	20. Lower jaws wider.
21. Skin of belly smooth.	21. Skin of belly roughly granular.
22. Second finger shorter.	22. Second finger longer.
23. Iris old gold to slightly greenish.	23. Iris more smoky.

*The males of both species have the snout less rounded or more pointed than the females.

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Chamaeleo ituriensis Schmidt

Chamaeleo ituriensis Schmidt 1919, Bull. Amer. Mus. Nat. Hist., 39, p. 589, fig. 25, pl. 31, fig. 2, pl. 32, figs. 1-5 (Medje, Avakubi, Gamangui, Batama).

It is rather surprising that this species has been synonymized with *Chamaeleo johnstoni,* after having been distinguished so accurately by K. P. Schmidt, who clearly recorded the absence of horns in the male.

This character was called to my attention at Lutunguru, when, getting more and more "females of *johnstoni,*" I saw the hemipenes extruded on one of those specimens. Five of the sixteen individuals secured at Lutunguru proved to be males, completely devoid of horns. At first, not remembering Schmidt's description, I believed I had discovered a new form; but returning for a few months at the Congo Museum, my specimens proved to be identical with a cotype of *Chamaeleo ituriensis.* Numerous specimens in the Congo Museum collection belong as well to this neglected species.

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The geographical relations of this species with *C. johnstoni* are very much the same as those I described recently between *Phrynobatrachus dendrobates* (Boulenger) and the similarly neglected *Phrynobatrachus petropedatoides* Ahl. The possibility of subspecific relations with *johnstoni* is not excluded. I hope to be able to settle the question with the numerous specimens of both forms I obtained in the Kivu and the Ruanda Urundi.

For the present, I give here a list of the localities from which *Chamaeleo ituriensis* is known to me. American Museum of Natural History: Medje, Avakubi, Batama, Gamangui; Musée du Congo Belge: Medje, Yangambi, Arebi, Panga, Mongbwalu, Buta, Angumu, Lubongola, Pilipili; my collections: Lutunguru and several other localities from which the material is not yet studied.

Description. Head rather elongate, without horns or appendages in either sex. Casque high behind, prominently higher than the vertebral line. Parietal crest more or less distinct, short, not forking; temporal crest conspicuous. Distance between top of casque and commissure less than length of mouth. Occipital flaps vestigal or indistinct; one or two tubercular rostral scales; two, three or four scales between them and the anterior labials. Sides covered with granular scales with three to five irregular series of flat and oval tubercles on dorsal part of body. No dorsal crest, but vertebral line slightly sinuous. No gular crest; in pectoral region, some slightly enlarged scales represent a vestigial ventral crest. Median gular scales very small, granular on sides of gular region, which shows several folds, with alternating longitudinal series of minute granules and of enlarged scales or conical tubercles. Tail a little longer or a little shorter than head and body.

Coloration (in life) generally dark green, yellowish, brownish or olivaceous, with irregular darker green markings; a whitish line on middle of belly; no white line on throat.

Affinities. This form, whether specifically or only subspecifically distinct from *C. johnstoni,* may be distinguished from it by the lack of horns in the male, the higher casque, the longer head, the more numerous dorsolateral tubercles and the smaller gular granules. The males are smaller than the females, while I observed the reverse is true in *C. johnstoni.*

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A Note on the Geographical Incidence of Poisonous Snakes

By HOWARD CAMPBELL

It recently occurred to the writer to wonder how the relative incidence of poisonous to non-poisonous snake species in the Southwest compares with the same relation in the United States as a whole and in the world generally. This information does not appear to have been conveniently summarized, at least in any of the commonly available literature. The following table has therefore been compiled, using the various references listed. The writer's home State of New Mexico is taken as being fairly characteristic of the Southwest in an inclusive sense. In all cases, full species only are considered, subspecies being left out of account.

The similarity in the percentage figures revealed in the table is rather striking, showing as it does that in respect to the character under consideration the serpent fauna of New Mexico in particular, and probably of the Southwest in general, approximates that of the selected larger areas, particularly with reference to dangerously poisonous species. Judging by the table, New Mexico is somewhat short on mildly poisonous, back-fanged species relative to the United States as a whole and even more so relative to the globe as a whole. This would be less true of the Southwest in general, owing to the known presence in Arizona, California and Texas of more opisthoglyphs than the three species (*Tantilla atriceps, Tantilla nigriceps,* and *Trimorphodon vilkinsonii*) so far recorded for New Mexico, or, in the case of *T. vilkinsonii,* reasonably to be expected there.

The correlations here discussed do not, of course, exist for all areas of comparable size, since some have a much higher proportion of venomous snakes (e.g., Australia), and various other large areas of the Earth undoubtedly have a much lower proportion.

TABLE 1. Incidence of Poisonous Snakes.

Region	Total snake species	All poisonous species	Per cent of total	Dangerously poisonous species	Per cent of total
New Mexico*	43	10	23.3	7	16.3
United States*	116	33	28.4	19	16.4
Entire world**	1686+	610	Approx. 36.0	308	Approx. 18.0
Entire world***	2000	600	30.0		

* Figures based chiefly on Perkins' "Key," Schmidt and Davis' "Field Book," and Stejneger and Barbour's 5th Ed. "Check List."

** Using figures compiled from Ditmars, *Reptiles of the World,* 1933 edition, pp. 126-135.

*** Using figures given by Parker and Schmidt, article "Snakes," *Encyclopedia Britannica,* 1951.

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The Loggerhead Turtles (Carettinae) of Europe

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Very little is known about the Carettinae of Europe. The first authentic name conferred upon one was when Schoepff restricted Linné's name *Testudo caretta* to a specimen of what is undoubtedly the Mexican olive loggerhead or ridley now known as *Lepidochelys olivacea kempi* (Garman). The correct name for the brown-red loggerhead is not the one generally assigned to it today, namely *Caretta caretta* (Linné) and might well be *Thalassochelys caouana* (Daudin), type locality Jamaica, West Indies (Deraniyagala 1943; Smith and Taylor, 1950). The names now in general use for Atlantic loggerheads are *Lepidochelys olivacea kempi* (Garman) for the ridley or olive-back and *Caretta caretta caretta* (Linné) for the brown-red.

Until recently it was generally assumed that the East Atlantic possessed only a single loggerhead, but in 1939 it was shown to harbor two races of olive-back and one brown-red (Deraniyagala 1939). The identity of the last however remained obscure since its two races were then known apart by a single variable character of differentiation, namely the neural bones of the carapace, and an examination of a series of skeletons from Europe was impracticaable. The recent discovery of a more accessible character was the difference in the average number of marginal scutes, the 'forma typica' generally possessing 12 pairs, the race *gigas* 13. Examination of the European material tabulated below now reveals that the Indo-Pacific race *gigas* of the brown-red has accompanied its olive-backed associate into the east Atlantic as was suspected some time ago (Deraniyagala 1943).

Specimens of *Caretta caretta* in the British Museum

	Specimen	Marginals	Locality
(a)	Adult	12/12	Sicily
(b)	Adult	13/13	Italy
(c)	Adult	13/13	Atlantic
(d)	1/3 Grown	13/13	Atlantic
(e)	1/4 Grown	13/13	Atlantic
(f)	1/4 Grown	13/13	Selsey Bill, Sussex
(g)	1/4 Grown	13/13	Eire

Specimens of *Caretta caretta* in the National Museum of Eire include (a) Reg. No. 75—1938 from Black Sod Bay, West Mayo; (b) No. 11. 1945 from Galway Bay and (c) No. 39. 1945 from Tralee, County Clare.

This knowledge is now utilized in unravelling another problem. The discovery of the ridley in British waters (Deraniyagala 1938) aroused much interest, being commented upon in a series of articles in such diverse British publications as Nature, the Proceedings of the Linnean Society of London, the Illustrated London News, the Times, and Blue Peter. It was then surmised that both the ridley and its companion, the brown-red loggerhead, were transported from American waters by the Gulf Stream. However, the capture of a young ridley from the Azores suggested these islands as the probable source from which the turtles entered British waters (Deraniyagala 1939) but this possibility was not generally accepted. It is now shown that the brown-red compànion of the ridley found in European waters is not of American origin, consequently it is extremely unlikely that the latter alone is American.

The probability is that the original range of the ridley has been greatly curtailed with the extension of cold conditions in the northern Atlantic, but in retreating southward it left a colony at the Azores which persisted owing to the warm influence of the Gulf Stream. Supporting this view are the marine shells that have also retreated southwards occurring only as fossils at Sankaty Head in Nantucket Sound but found alive further south along the American coast (Cushman 1906; Shimer 1918).

The question as to whether the European ridleys differ from those of America, e.g., in being of smaller size, of a different color, and also in the average number and arrangement of the neural bones, is worth investigating since the British Museum possesses a sufficient number of specimens for such a study.

I here wish to express my cordial thanks to Dr. H. W. Parker of that institution and to Miss Geraldine Roche of the National Museum of Eire for their kindness in permitting me to examine the collections in their charge.

In conclusion it will be perceived that:—

(1) Both the Indo-Pacific race of brown-red loggerhead *Caretta caretta gigas* Deraniyagala and the olive-backed *Lepidochelys olivacea olivacea* (Eschscholtz) inhabit the East Atlantic, which also possesses a small colony of *Lepidochelys olivacea kempi* (Garman).

(2) The West Atlantic possesses the 'forma typica' of the brown-red loggerhead *Caretta caretta caretta* (Linné) and also a race of the olive loggerhead *Lepidochelys olivacea kempi* (Garman).

(3) The existing nomenclature of the Carettinae or loggerhead turtles will be completely demolished if the law of Priority is enforced.

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Notes on a Collection of Reptiles and Amphibians from Oaxaca, Mexico

By BAYARD H. BRATTSTROM and NELLY B. ADIS

During the fall of 1951, from August to December, the junior writer collected a series of 78 specimens of reptiles and amphibians from Soyaltepec, district of Tuxtepec, in extreme northern Oaxaca, Mexico. Of these, 45 specimens, representing 12 species and including 2 state records, are now in the collection of the University of California at Los Angeles. The remainder of the collection was deposited at the Laboratory of Zoology and Comparative Anatomy, Instituto Politécnico Nacional, Mexico, D. F.

A general description of the area can be found in Llamas (1947) who places it in the "Zona de bosque mesófilo tropical de cerro."

The nematodes recovered from these specimens are being studied by Read and Amrein.

Bufo valliceps Wiegmann

Five specimens agree with the characters of this species as redefined by Firschein (1950). Stomach contents include beetles (Carabidae, Tenebrionidae and Scarabaeidae), ants and grasshoppers (Orthoptera, Locustidae). Two specimens were found in amplexus on August 24.

Bufo horribilis Wiegmann

Four specimens contained ants and beetles (Scarabaeidae and Platypodidae) in the stomach. Included also were a few leaves, probably eaten accidentally.

Leptodactylus labialis (Cope)

One specimen contained a beetle (Coleoptera, Platypodidae).

Smilisca baudini baudini (Duméril and Bibron)

The two specimens of hylids are in bad condition, but are apparently of this species.

Coleonyx elegans elegans Gray

One specimen, found during the day, agrees with *C. e. elegans* in all characters (especially in having more tubercles laterally), except in the presence of a small scale separating the prenasals. Klauber (1945) found the prenasals in contact in only 1 out of 4 *C. e. nemoralis* whereas they were in contact in 65 out of 69 *C. e. elegans.*

Ants (Hymenoptera, Formicidae) and unidentified insect parts were found in the digestive tract. This species is highly feared by the inhabitants of the region where it is called "perrito" and is considered to be fanged and very poisonous.

Anolis sallaei Günther

One specimen has been compared with other examples and with descriptions of the species, with which it agrees. The dorsals and ventrals are strongly keeled, the latter somewhat larger than the dorsals. Three enlarged supraoculars are separated from the supraorbital semicircles by a single series of scales. The occipital is of about the same size as the ear opening, and the scales of the supraorbital semicircles are enlarged and separated by a single series of scales.

The dewlap in the preserved specimen is small and orange-pink medially with two lateral areas of purplish-brown. The scales of the lateral areas appear as white flecks on a darker subepidermal color. The

snout-vent measurement is 34 mm., tip of snout to posterior margin of ear 10 mm., and head width 5.9 mm.

Basiliscus vittatus Wiegmann

One small specimen contained a grasshopper (Orthoptera, Locustidae) in the stomach.

Sceloporus variabilis variabilis Wiegmann

Twenty-two specimens of this common lizard were collected. The Mazatec (local Indian dialect) name for this lizard is "Turuchu."

Most of the lizards contained Lepidoptera larvae, ants, flies, beetles and hemipterans. Nematodes were found in the intestines of a few and a new species of *Plasmodium* was found in the blood of a number of specimens which were brought alive to Mexico City. A probable new species of tick was also found on these specimens.

Ameiva undulata amphigramma Smith and Laufe

The characters of the five specimens all agree with those mentioned by Smith and Laufe (1946). In fact the species has been collected from this locality before (*op. cit.*). One female contained 7 eggs.

Spiders (Agalenidae) were found in 4 of the 5 specimens. A belostomatid was found in one and a *Blattaria* in another. One specimen contained 2 Thysanura, 3 ants, 1 moth and 1 Lepidoptera larva.

Scincella gemmingeri gemmingeri (Cope)

One specimen contained ants, grasshoppers and beetles.

Scaphiodontophis albonuchalis Taylor and Smith

The single specimen collected proves to be the first recorded of this species from Oaxaca. The snake is typical in coloration and scale counts (Taylor and Smith, 1943). The specimen is a male with 148 ventrals, 45 caudals and 17 scale rows.

Leptodeira annulata taylori Smith

One male with 211 ventrals, 84 caudals, 39 body blotches and 23 scale rows is the first recorded of this subspecies from the state. It was caught in a palm-roofed adobe house about 9:00 p.m. The house was brightly lighted by a gasoline lamp.

Nematodes were taken from the esophagus and anterior portion of the stomach.

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Diurnal Activities of a Nocturnal Animal

By BAYARD H. BRATTSTROM

The increasing mass of evidence regarding the function of the pituitary gland of animals in relation to solar radiation and sexual and other associated cycles, and the known importance of Vitamin D and other physiological factors associated with absorption of solar radiation, would seem to make desirable the report of instances of diurnal activity observed in supposedly nocturnal animals. This is especially true for the species of terrestrial animals that habitually live underground during daylight hours, and which by means of protrusion of the head alone could presumably receive adequate dosages of light sufficient to induce such responses as reported for birds and mammals.

It is unfortunate that so little attention has hitherto been directed toward obtaining more explicit evidence on the ecological factors that might have been involved in bringing about the occasional encounters with supposedly strictly nocturnal animals captured during daylight hours. In general it has been assumed that the activity of some putative predator has driven these animals into the open, or that in each instance, no matter how many times repeated, their occurrence in daylight is an isolated accidental event without additional significance.

All experienced desert collectors can recall many instances of unusual diurnal activity, yet because of a supposed lack of significance, few of these observations have been deemed worthy of publication. The present report may serve to emphasize the desirability of investigating the factors that may account for these supposedly accidental appearances. Nocturnal, burrowing or sand dwelling animals are all worthy of attention.

The only available literature reporting diurnal occurrence of nocturnal lizards is that of Klauber (1945) who mentions, concerning the habits of *Coleonyx v. variegatus,* " . . . I have never encountered one in full daylight except on one occasion when no place of concealment was available. This was on a tiny island in Lake Meade (June 16, 1936) which was about to be inundated for the first time by the rising water of the dam."

In view of the scarcity of information on these animals, it is therefore of some interest to record the occurrence of a *Coleonyx v. variegatus* observed in the open at 5:30 p.m. (D.S.T.), on April 29, 1952, 20 mi. N Vidal Junction, San Bernardino Co., California. The observation was made about 2½ hours before sunset and the sun was well above the horizon. There were no clouds in the sky. The lizard was first sighted on the west slope of a small hill and ran under a rock, approximately 12 inches away, where it was captured. Of special interest was the body temperature of the lizard, which was found to be 29° C. compared with 24° C. for the air and 23.2° C. for the soil. This is indicative that perhaps the exposure was deliberate. It is also possible that the lizard could have been scared out of its hiding place, as is usually supposed in these instances, and due to the dark coloration of the lizard (it was found in an area of black basalt boulders) it had absorbed this amount of heat in the limited time that it was in the sunlight. A general examination of the area revealed no possible enemies, however, and there were no signs of rodent holes.

The first suggestion seems perhaps nearer the truth, especially since the temperature taken on another specimen of the same species collected

under a rock in the same area about 15 minutes later was 27.8° C. compared with 23.5° C. for the air and 22.6° C. for the soil.

The following day a *Coleonyx* was collected under a rock, 17 mi. NE of Needles, San Bernardino Co., at 12:25 p.m. (D.S.T.), with a body temperature of 31.6° C. The air and soil temperature under the same rock were 24° C. and 21° C.

Further suggestion of the possibility that these nocturnal geckos come out in the daytime to absorb heat is suggested by occasional early records at dusk. Klauber (1945) mentions, "It has been my experience that the first individuals may be out before darkness is complete, but they are not most active until later." Strecker (1909) mentions in regard to *C. brevis*, "I collected a single example of this little gecko in the Chisos foot-hills. It was running around among the rocks on a hillside just before dusk." The peculiar pupil shape, retention of moveable eyelids, and the absence of a spectacle in this genus (Underwood, 1951) may also be associated with this type of activity.

Records of diurnality in other nocturnal reptiles are available in the literature. Klauber (1951) makes note of two diurnal records of *Chionactis occipitalis* at 9:40 a.m. and 5:10 p.m. Cowles (Personal Comm.) has observed 4 cases (10 animals) of diurnal *C. occipitalis*, one of which has been recorded in the literature (1920). On one of these occasions, April, 1951, 9.8 mi. NW Ludlow, San Bernardino Co., California, Cowles observed and collected 6 individuals in one hour in the late afternoon on the west side of a small hill.

Arizona is generally considered to be nocturnal (Klauber, 1946), but Klauber (1946), Taylor (1929), Linsdale (1932, 1940), and Cowles (1941) record diurnal activity for *Arizona elegans elegans, blanchardi, eburnata,* and *occidentalis*.

Crotalus cerastes has been recorded in the daytime by Klauber (1944). The writer collected a pregnant female about 2 hours before sunset at San Felipe, Baja California, Mexico. This specimen was about one foot from a hole under a small bush. Cowles (Personal Comm.) has observed the species in the direct sun.

Miller (1951) suggests that *Xantusia vigilis* is diurnal during the winter months.

Genera such as *Rhinocheilus* and *Pituophis* appear to be both diurnal and nocturnal.

It is usually true that during the late afternoon hours, collectors are seldom active, and thus few observations could be made in this critical period of time. On the other hand certainly many diurnal occurrences in essentially nocturnal animals have been overlooked or misinterpreted. Undoubtedly additional observation in early evening will add many more instances of what is presently considered exceptional behavior.

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THE MATING PERIOD OF THE GIANT TREE FROG *HYLA DOMINICENSIS*—A. F. Carr (Univ. Fla. Pbl. 3:62, 1940) states that the breeding period of *Hyla dominicensis* occurs between June 14 and September 16; Wright and Wright (Handb. Frogs, Toads, 1949: 340) add nothing to this statement, but Mittleman (Herp., 6:20, 1950) records an earlier date for breeding, May 6.

Still earlier, on April 27, 1952, between 12:00 p.m. and 2:00 a.m., we found *Hyla dominicensis* breeding on the west side of U.S. Highway 1 on Key Vaca, Monroe County, Florida. In the process of capturing them the only pair we saw separated and only the female was captured. It had several eggs adhering to the anal area. A total of 55 specimens were captured, 4 of which were females. In captivity several entered into amplexus and one pair laid three masses of eggs. Also mating on Key Vaca and in many other areas from Homestead to the lower keys were *Hyla cinerea* and *Microhyla carolinensis.*

We saw and captured two dark-phase and one orange-phase *Natrix sipedon compressicauda,* two *Agkistrodon piscivorus,* and one *Kinosternon bauri.* It was thought that the snakes were feeding on the *Hyla dominicensis* since they were very active in that area and since there were not many fish in the water.

All of the above specimens were seen and captured in water that was definitely brackish. Although this is not unusual for both forms of snakes and the turtle mentioned, it is rather unusual for the amphibia.—HAROLD W. PETERSON, RONALD GARRETT and JOHN PERRY LANTZ, University of Miami, Miami, Florida.

A NOTE ON THE FOOD OF THE GILA MONSTER, *HELODERMA SUSPECTUM Cope*—A young Gila Monster, approximately thirteen inches long, taken in South Mountain just south of Phoenix, Arizona, regurgitated two young ground squirrels (*Citellus tereticaudus arizonae*) during the first night of its captivity. Although the nature of the food of the Gila Monster is a well established fact,[1] the large quantity regurgitated by so small an Heloderma is noteworthy. The accompanying photograph illustrates this well.—HERBERT L. STAHNKE, Poisonous Animals Research Laboratory, Arizona State College, Tempe, Arizona.

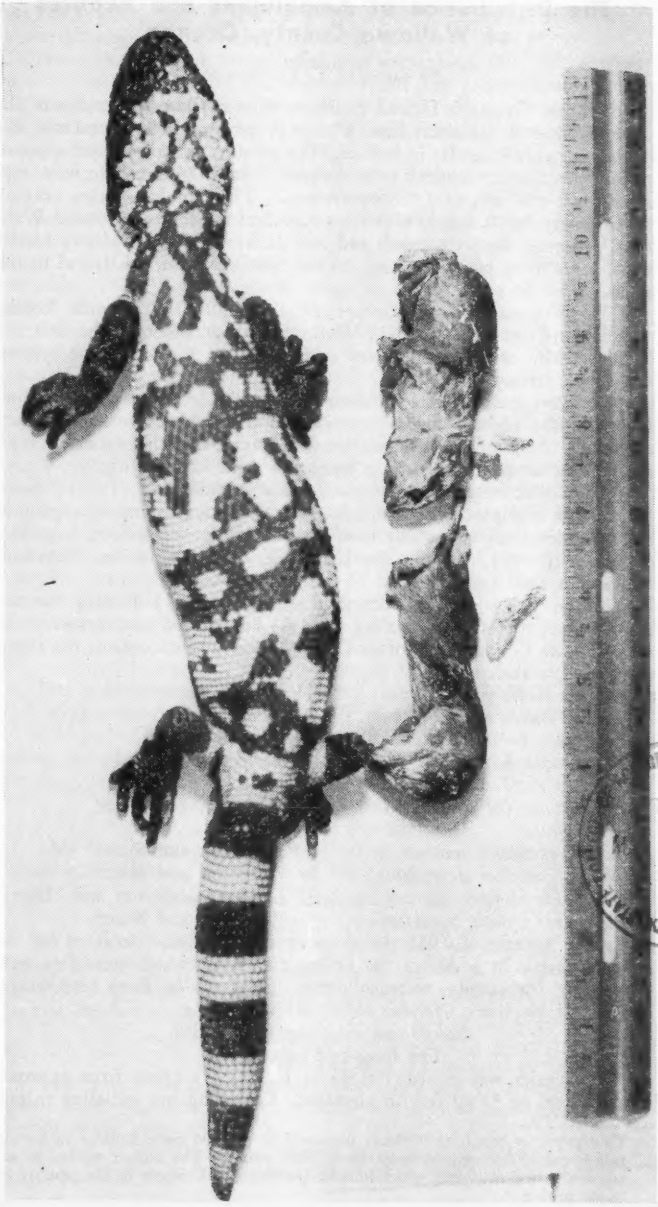
[1] Stahnke, H. L., *The Food of the Gila Monster,* Herpetologica, Vol. 6, 1950, pp. 103-106.

PROBABLY THE FIRST LEGISLATION TO PROTECT A POISONOUS ANIMAL.—"The Act Relating to the Protection of Reptiles, Including the Horned Toad and Gila Monster" is found on Page 3, under Commission Order No. P-6 in the permanent commission order book of the Arizona Game and Fish Commission. It is dated January 12, 1952. It reads as follows:

> "The gila monster *Heloderma suspectum* (Cope) and the horned lizard (toad) of the genus *Phrynosoma* are classified as protected animal species and may be taken only in such a manner as the Commission may prescribe. Neither of the above described species may be sold, given, offered for sale or exchanged except by written permission of the Commission."

The clause, ". . . taken only in such manner as the Commission may prescribe," refers to the Commission's effort to restrict the taking of the gila monster by all individuals other than those involved in actual research work. The Commission is encountering considerable difficulty in putting this order into effect as far as the zoos and roadside reptile gardens are concerned.

Dr. Herbert A. Stahnke of the State College at Tempe is conducting research using venom of the gila monster and he is the only person to whom a permit for collecting purposes for this reptile has been issued. Roadside zoos have been allowed to keep the specimens they had on hand prior to the legislation and are required to report any changes in numbers listed on their original applications. Up to Oct. 1, 1952, two cases have come up. One resulted in a $25.00 fine and the other is still pending. Mr. Ernest E. Mulch, Acting Director, writes: "Since the act protects the gila monster, that includes the killing of this animal as well as the keeping of it." Mr. Mulch states in "Why protect the gila monster," Ariz. Wildlife Sportsman, 1952, pp. 30-31, that gila monsters have been retailing at from 20 to 40 dollars and that there has been only one fatality recorded from gila monster bite to date and that was in 1930. —CHAPMAN GRANT.



7 1954
KANSAS

The Distribution of Amphibians and Reptiles of Wallowa County, Oregon[1]

By DENZEL E. FERGUSON

Wallowa County is located in the extreme northeastern corner of the state of Oregon. As rivers form a large proportion of its boundaries, the county is rather irregular in outline. The greatest dimensions are approximately 64 miles from north to south and 72 miles from east to west, representing a total area of 3,178 square miles. The Blue Mountains, ranging up to nearly 7,000 feet in elevation, surround the centrally located Wallowa Valley on the west, north and east sides, while the Wallowa Mountains, with some peaks reaching 10,000 feet elevation, are found to the south.

The Wenaha, Minam, Lostine, Wallowa, Imnaha, Grande Ronde, and Snake Rivers are found in Wallowa County, but only the first five listed actually originate and have most or all of their drainage systems within the county's boundaries.

The average annual precipitation varies with elevation from nearly 40 inches in the higher mountain regions to less than 15 inches at lower elevations. Most of the precipitation falls during the winter months, with the greatest amount occurring in January and the least in July.

The climax vegetation consists mainly of montane *(Pinus-Pseudotsuga)* and subalpine forests *(Picea-Abies)*, although southern exposures at lower elevations are usually nonforested. Life zones present, according to Bailey (1936), include the Upper Sonoran, Transition, Canadian, Hudsonian and Arctic Alpine.

Gordon (1939) and Anderson and Slater (1941) furnish the two main sources of reference dealing with the distribution and occurrence of the Wallowa County herpetofauna. The following list contains the forms mentioned in their accounts:

Ambystoma macrodactylum	Gordon
Ascaphus truei	Gordon
Bufo boreas boreas	Gordon
Rana pretiosa luteiventris	Gordon
Sceloporus occidentalis occidentalis (or *biseriatus)*	Anderson and Slater
Charina bottae	Gordon
Coluber constrictor mormon	Anderson and Slater
Pituophis catenifer deserticola	Anderson and Slater
Thamnophis elegans vagrans	Gordon, Anderson and Slater
Thamnophis sirtalis tetrataenia	Anderson and Slater

In the summer of 1951 the above species were also collected for the present study. In addition, the following forms, which constitute new records for the county, were collected: *Hyla regilla, Rana catesbeiana, Eumeces skiltonianus, Crotalus viridis oreganus.*

Ambystoma macrodactylum Baird

The long-toed salamander

This species was recorded from 21 localities, ranging from approximately 2,000 to 7,800 feet in elevation. Collecting has indicated that it

1. This paper is based on a thesis presented to Oregon State College in partial fulfillment of the requirements for a M.S. degree. The author wishes to acknowledge the assistance given him by Dr. Robert M. Storm in his capacity of major professor.

occurs over the entire county except perhaps in the very hot, low canyons. Since field work was done during the summer, adults were difficult to locate, although larvae were easily obtained.

Three exceptionally large individuals measuring 139, 141 and 155 mm. in total length were collected at 7,800 feet elevation near Mirror Lake in the Wallowa Mountains. Bishop (1947:140-141) has stated that two specimens measuring 122.5 and 127 mm. "are perhaps exceptionally large individuals."

Ascaphus truei montanus Stejneger

The bell toad

A total of 89 adults and larvae were collected from 10 localities. These specimens were found in the cold, fast-flowing portions of Hurricane Creek, Lick Creek, and the Lostine River, all being above 5,000 feet elevation in the Wallowa Mountains. The temperatures of these streams ranged from 9 to 11° C.

On August 19, 1951, a series of 66 *A. t. montanus* was collected near the forks of the Lostine River, which included 21 larvae ranging from 21 to 62 mm. in total length and 45 adults ranging from 25 to 43 mm. in body length. Nearly all stages or age groups were represented as there were small larvae, very large larvae without limbs, some with well developed limbs and large tails, larvae with well developed limbs and only a vestige of the tail remaining, some which were only recently metamorphosed, and full sized adults. It is almost a certainty that the poorly developed tadpoles found this late in the summer, at an elevation approximating 5,000 feet, would be unable to complete transformation to adults before the arrival of winter. Yet, it was apparent that some had or would complete transformation by the end of the summer. Thus, this series clearly points out that bell toads in the area require two years to reach the postmetamorphic stage.

Bufo boreas boreas Baird and Girard

The northwestern toad

The northwestern toad was collected from 32 localities in the county, indicating a widespread distribution. It was taken at elevations of 2,000 to 7,700 feet. On August 14, 1951, a series of 16 recently metamorphosed young was obtained near Minam, which ranged from 17-22 mm. in total length.

Hyla regilla Baird and Girard

The Pacific tree frog

This species was recorded from 10 widespread locations. It is evidently quite common over most of the county.

Rana pretiosa luteiventris Thompson

The Nevada spotted frog

R. p. luteiventris was the most commonly encountered amphibian, having been collected from 23 localities. It appears to be widely dispersed throughout most of the county, for specimens were taken at elevations from 2,100 feet up to 7,700 feet.

Rana catesbeiana Shaw

The bullfrog

One specimen was found about three miles west of the town of Wallowa. What was taken to be a second-year larva of this species was observed at the same place.

Sceloporus occidentalis biseriatus Hallowell

The western blue-bellied lizard

This subspecies was collected from 10 localities in the Snake, Imnaha, and Grande Ronde River Canyons. Collecting has indicated that it is confined to these hot, dry canyons.

Eumeces skiltonianus (Baird and Girard)

The western skink

The western skink was recorded from four localities and appears to have quite a wide distribution in the county, probably not occurring, however, in the higher portions of the Wallowa Mountains.

Charina bottae utahensis Van Denburgh

The rubber boa

The rubber boa was collected in four localities and apparently ranges quite extensively over much of the county at elevations below 5,000 feet.

Coluber constrictor mormon Baird and Girard

The western yellow-bellied racer

This snake was taken in 12 localities in the low, hot canyons, where it was found to occupy areas having rather dry, rocky hills. It was found to range up to nearly 4,000 feet elevation.

Pituophis catenifer deserticola Stejneger

The desert gopher snake

This form, recorded from 8 localities in the Imnaha, Snake, and Grande Ronde River Canyons, is apparently limited in its distribution to the canyons in much the same manner as *C. c. mormon.*

Thamnophis elegans vagrans Baird and Girard

The wandering garter snake

The wandering garter snake is the most common and widely ranging member of the Wallowa County herpetofauna, having been recorded from 31 localities. It is found at elevations of little more than 1,000 feet in the Snake River Canyon up to approximately 7,300 feet in the Wallowas.

Thamnophis sirtalis tetrataenia (Cope in Yarrow)

The Pacific garter snake

This subspecies was collected from seven places in the Wallowa Valley and Grande Ronde River Canyon, all of them being above 2,500 feet elevation. It does not seem to occur along the drier eastern edge of the county.

Crotalus viridis oreganus Holbrook

The Pacific rattlesnake

Records were obtained for this snake from six localities, all in the canyons of the Snake, Imnaha, Grande Ronde, and Wallowa Rivers. It was not found above 3,000 feet elevation.

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NOTES ON THE EGGS AND YOUNG OF *PITUOPHIS MELANOLEUCUS SAYI*.—A consignment of reptiles received on May 26, 1952 from Salina, Kansas contained several adult specimens of the common Bull Snake, *Pituophis melanoleucus sayi*. Upon examination, one of these specimens was found to be a gravid female. The following notes on the eggs and the resultant young may prove of interest as they vary somewhat from the general information on the species.

The female, 51 inches in length, fed readily and continued to do so for three weeks, (June 14) when she abruptly refused all food offered. The specimen fasted until the week following deposition of the eggs, at which time it consumed two mice.

Deposition of the eggs commenced at 6:20 a.m. on June 27. Two eggs had been laid, when a piece of damp toweling was placed in the cage, under which the specimen promptly disappeared. It was subsequently found that the remainder of the eggs were deposited beneath it. Deposition was completed within a period of three hours, a total of nine eggs forming the clutch. The elliptical, adherent eggs were rough to the touch and were dull white in color. They were removed from the cage and separated, in two instances leaving the integument quite thin. (See eggs 7 and 9 in the second table of measurements.) After being measured and numbered in the approximate order of their appearance, they were placed in a flat dish lined with moist paper toweling, as per the method recommended by Perkins (Herpetologica 4, 184). The average temperature of this container during the incubation period was 79° F.

The initial measurements were as follows:

EGG	LENGTH	WIDTH	EGG	LENGTH	WIDTH
1	5.8 cm.	2.8 cm.	6	5.4 cm.	2.8 cm.
2	6 cm.	2.9 cm.	7	4.8 cm.	2.7 cm.
3	5 cm.	2.9 cm.	8	4.9 cm.	2.9 cm.
4	5 cm.	3.1 cm.	9	5.7 cm.	2.9 cm.
5	5.5 cm.	2.9 cm.			

During the first 18 days following deposition, the eggs showed little increase in size, but did increase slightly in weight. The shells had become taut, in contrast to their initial laxity. By the 23rd day (July 19) the eggs began to show a definite increase in size and on the 22nd of July they were re-measured.

EGG	LENGTH	WIDTH	REMARKS
1	6 cm.	3.1 cm.	
2	5.2 cm.	3.2 cm.	
3	5.2 cm.	2.9 cm.	
4	5.8 cm.	3 cm.	
5	5.9 cm.	3.2 cm.	
6	—	—	Shell became indented and soft July 2. No embryo present.
7	5.1 cm.	3.2 cm.	At the thin area of the shell, the egg was longer by .4 cm., the egg being 5.5 x 3.2 cm.
8	5 cm.	2.9 cm.	
9	5 cm.	3.3 cm.	At the thin area of the shell, this egg was longer by .2 cm., the egg being 5.2 cm. x 3.3 cm.

Although cleanliness was carefully attended to, mold was a constant problem. The toweling was changed as often as necessary and any mold found developing on the eggs was promptly removed with a swab. Despite these precautions, egg 8 became moldy and on July 26 the shell began to collapse. When opened it contained nothing except a viscid, yellowish fluid. On August 8, the shell of egg 3 began to collapse and mold. It was opened and found to contain the same yellowish fluid as was found in egg 8.

Measurement on August 13 showed little gain in size, eggs 2, 3, and 7 showing an increase in length of .1, .1, and .2 cm. respectively. By August 18th, the pattern of the embryos could be discerned through the thin area of the shells of eggs 7 and 9.

Hatching began on the morning of August 22, when egg 4 showed two long, triangular slashes on its upper surface. Observation a short time later found the head of the young snake protruding from the smaller of the slits. It immediately withdrew into the egg and after a day of alternately protruding and withdrawing its head, the specimen completely deserted the shell the morning of August 23. It measured 10¼ inches in length.

At 9 a.m. August 23, egg 9 began to hatch. With the exception of its making five long parallel slashes in the shell, its hatching behavior was essentially the same as that of egg 4. It left the egg completely the evening of August 24 and measured 11½ inches in length.

Egg 7 hatched on the morning of August 24 and left the egg late in evening of the same day. Its length was 11¾ inches. Its hatching behavior was the same as egg 4.

Egg 5 hatched the morning of August 25, but showed only its head until the evening of August 27, when it was found coiled beside the egg. Its hatching behavior was the same as eggs 4 and 7, with the exception of its taking a longer period of time to completely evacuate the shell. This specimen, the last one to hatch, measured slightly in excess of 11 inches.

The two remaining eggs (1 and 2) showed no signs of hatching and on August 30 they were opened. Egg 1 showed a poorly defined embryo, along with a semi-solid yellowish fluid. Egg 2 showed a well developed embryo with a small quantity of blood streaked, yellow fluid.

It should here be mentioned that, although the newly born snakes were examined under magnification, the presence of an egg tooth could not be found.

The four young snakes did not show typical adult coloration until they shed their skins. Ecdysis took place, in each instance, exactly ten days after complete evacuation of the egg.

Although it is stated that the young do not feed until over wintering or at least fasting for two months, the two specimens retained for observation showed interest in the movement of a finger tip across the glass cage front and on September 13, each consumed three rear legs of mice. The mouse legs were taken with no hesitation and as soon as one was disposed of, there was a frantic search for more. The young snakes are not as active as the adults that have been in the writer's collection, and spend most of the time in the hiding place provided.—J. M. MEHRTENS, St. Albans, New York.

Notes on the Eggs and Young of Some United States and Mexican Lizards, I

By CHARLES E. SHAW

In the course of maintaining a collection of living lizards there are frequent opportunities to observe some aspects of their reproductive behavior. The acquisition of gravid females that have been impregnated under natural conditions in the field has offered a source of information concerning egg size, egg growth, clutch complements, and the size of the young at hatching. Occasional captive matings have provided additional information relative to courtship behavior, but the present notes deal only with observations concerning eggs and young.

Incubation of eggs as reported below has occurred in the office of the reptile house of the San Diego Zoo where air temperatures during the late spring and summer months range from about 70° to 95° F. All eggs have been incubated in crocks measuring 6 inches in diameter and 3 inches in depth. Crocks are prepared for incubation by placing 40 cc of water in each and then adding two inches of screened sand. A cover glass is then placed over the top of each crock and it is allowed to stand for about a week, a time sufficient for the moisture to spread rather evenly through the sand. Eggs are buried about one-half inch below the sand surface. During incubation of the eggs 5 to 10 cc of water may be added occasionally by pouring it around the inner edge of the crock whenever it is deemed necessary to do so.

The eggs of most lizards with which I have had experience have rather thin, flexible shells and are prone to rapid dessication in the absence of a moist environment. Therefore precautions must be taken to prevent their drying between the time they are deposited by the female and their discovery. A satisfactory method of overcoming this difficulty has been to place the gravid female in a glass jar containing an inch or two of dampened, but not wet, sphagnum or peat moss. Using this system the eggs can be laid late in the day or during the night and still be in good condition when found the following morning.

In the following notes I have recorded some data on eggs which, although they did not hatch for reasons unknown, have provided some information for forms concerning which such data is relatively scant or altogether lacking.

In many, but not all, instances newly laid eggs have been numbered with India ink to facilitate their later identification when determining the amount of egg growth during incubation.

Dipsosaurus dorsalis dorsalis — A female from the vicinity of Palm Springs, Riverside Co., California, laid 6 eggs on June 27. These had immaculate, creamy-white, flexible shells. Size range in length varied from 26.6 mm to 28.5 mm, mean 27.5 mm. Width varied from 15.6 mm to 16.5 mm, mean 16.1 mm. These eggs spoiled after about two weeks incubation although all contained small embryos.

Another female Desert Iguana, also from the vicinity of Palm Springs, Riverside Co., California, laid 4 eggs on August 11 and another on August 13 which was found ruptured in the cage. These were creamy-white in color with immaculate, flexible shells. Length measurements of

the four eggs laid August 11 ranged from 26.6 mm to 31.9 mm, mean 28.7 mm. Width varied from 16.4 mm to 19.3 mm, mean 17.8 mm. These eggs spoiled, but all contained small embryos.

Sauromalus obesus obesus — A female from 3 miles north of Pisgah Crater, San Bernardino Co., California, laid 10 eggs on August 1. Six of these were considerably smaller than the remainder and no attempt was made to incubate them. The other 4 eggs varied in length from 33.1 mm to 35.0 mm, mean 34.2 mm. Width ranged from 19.1 mm to 20.1 mm with a mean of 19.4 mm. These eggs had immaculate white, flexible shells. After incubating about 2 weeks the eggs spoiled. They contained embryos about 20 mm in length.

Another Chuckwalla from the Borrego Desert, San Diego Co., California, was discovered dead in the collection on August 12. Eight eggs were removed from her oviducts. Seven of these were normal in appearance while the eighth had a large knob on one side and was also stained green, apparently from the deterioration of the gall bladder of the dead female. This egg was opened and found to contain a living embryo about 5 mm in length. Measurements of the 7 remaining eggs were taken and these varied in length from 34.6 mm to 38.0 mm, mean 35.9 mm. Width ranged from 22.2 mm to 23.2 mm, mean 22.8 mm. These eggs were an immaculate white in color and had flexible shells. They spoiled in about 3 weeks and no attempt was made to determine their fertility.

Uma notata notata — A female from the sand hills 18 miles west of Yuma, in Imperial Co., California, laid 3 eggs on March 2. These were an immaculate cream-color and had flexible shells. They ranged in length from 17.6 mm to 18.6 mm, mean 18.1 mm. Width varied from 11.9 mm to 12.5 mm, mean 12.3 mm. These eggs did not appear to be fertile when they were later opened and examined. The early laying date was most likely the result of an altered reproductive cycle due to captivity since the female had been captive more than a year at the time of laying.

Uma notata cowlesi — A female, snout-vent length 85 mm, from Punta Peñasco, Sonora, Mexico, laid 3 eggs on June 27. These were immaculate white in color with flexible shells. In length they ranged from 16.5 mm to 17.5 mm, mean 16.96 mm. Width ranged from 10.0 mm to 10.8 mm, mean 10.3 mm. Two of these eggs spoiled within a few days after incubation was attempted. One of them contained a small embryo while the other did not appear to be fertile.

69 days after it was laid, the remaining egg was measured. Its length at this time was 21.5 mm and its width was 16.2 mm. These dimensions represented an increase of 22.8 per cent in length and 58.8 per cent in width. This egg failed to hatch and was opened on September 15. It was found to contain an apparently fully formed, but dead, embryo.

Crotaphytus wislizeni — A female from Arches National Monument, north of Moab, Grand Co., Utah, laid 2 eggs on June 25 and 3 more on June 26. One of those laid on June 25 was not well formed and was discarded. The remaining four eggs were measured and incubation was attempted. In length the eggs ranged from 19.8 mm to 25.1 mm, mean 22.2 mm. Width varied from 13.4 mm to 14.2 mm, mean 13.6 mm. These eggs spoiled after about one month of incubation. It is not known whether they were fertile.

Crotaphytus collaris baileyi — A female, snout-vent length 89 mm, from Four Peaks, northeast of Phoenix, Arizona, was noted in copulation with a male from Las Vegas, Nevada on July 4. At this time no nuptial

coloration was present on the female. But on July 6 the female's nuptial colors were much in evidence, brilliant red-orange spots and small blotches being scattered over the back of her head and on the sides of her neck. A red-orange transverse bar was also present, overlying the white area between the black collars. Immediately behind the posterior black collar another narrow transverse band of red-orange was present. On the remainder of the body a single narrow transverse bar of red-orange was located in the first light interspace between the broad dark body bands and a spot of the same color was situated at the ventrolateral edge of the second light interspace on the body.

This female was observed to mate only once. However, previous mating may have occurred so that the short period between the observed mating and the assumption of post-nuptial coloration may not represent the true interval necessary between these two events.

On July 28 this female laid 7 eggs. These were immaculate white in color and had flexible shells. In length they ranged from 18.4 mm to 20.3 mm with an average of 19.14 mm. Width varied from 11.4 mm to 11.7 mm, mean 11.6 mm. During incubation two of these eggs spoiled and appeared infertile when opened and examined. 59 days after being laid the remaining five eggs were again measured. At this time length ranged from 20.1 mm to 25.0 mm, mean 22.1 mm. Width varied from 12.9 mm to 17.3 mm, mean 15.3 mm. In length these eggs had increased an average of 14.73 per cent and in width 32.18 per cent.

Two of the eggs hatched on October 10 and one on October 12. The remaining eggs failed to hatch, but contained well developed embryos. The incubation period was 75 days to the date of first hatching. The young in this brood had the following total length-tail length measurements in millimeters: 84-50; 91-54; 95-57.

Sceloporus orcutti orcutti — A female from Sentenac Canyon, San Diego Co., California, snout-vent length 84 mm, laid 8 eggs on July 19. These were immaculate white and had flexible shells. In length they varied from 17.2 mm to 18.2 mm, mean 17.65 mm. Width ranged from 9.8 mm to 10.6 mm with a mean of 10.25 mm. All of the eggs in this clutch spoiled at various times during incubation, but all contained embryos in differing stages of development.

Sceloporus magister magister — A female, snout-vent length 102 mm, from 4 miles east of Scissor's Crossing, San Diego Co., California, laid 11 eggs on May 30. The eggs were immaculate white with flexible shells. The shells were very rough, having a pigskin-like appearance when viewed closely. In length the eggs ranged from 18.8 mm to 20.8 mm, mean 19.8 mm. Width ranged from 12.2 mm to 13.8 mm, mean 12.6 mm.

After 66 days of incubation the eggs were again measured. In length they varied from 21.8 mm to 25.2 mm, mean 23.6 mm. Width ranged from 16.5 mm to 18.2 mm, mean 17.2 mm. The average increment in length was 20.4 per cent and in width 36.5 per cent.

On August 19 after 82 days of incubation one egg hatched. Two eggs hatched on August 20, three on August 21, and 5 on August 22. In total length the young ranged from 78 mm to 88 mm, mean 85.2 mm. Tail length varied from 45 mm to 51 mm, mean 49.1 mm.

Sceloporus magister rufidorsum — A female from 20 miles southeast of Rosario, Baja California, snout-vent length 94 mm, deposited 7 eggs on June 18. Two of these were considerably shriveled and appeared to have

incompletely formed shells. The remaining five eggs were an immaculate creamy-white in color and had flexible shells. These five eggs ranged in length from 19.6 mm to 20.3 mm, mean 19.76 mm. Their width varied from 10.7 mm to 11.2 mm, mean 10.88 mm.

After 50 days of incubation the eggs were again measured and at this time varied in length from 20.0 mm to 22.5 mm, mean 20.94 mm. Width ranged from 13.3 mm to 15.0 mm, mean 13.98 mm. The average increment in length was 5.97 per cent and in width 28.49 per cent.

Hatching began August 18 on the sixty-first day of incubation and continued until August 20. The five young in this brood varied in total length from 67 mm to 71 mm, mean 69.2 mm. Tail length ranged from 32 mm to 33 mm, mean 32.4 mm.

Another female *rufidorsum* from 17 miles southeast of Rosario, Baja California, with a snout-vent length of 97 mm, laid 11 eggs on June 27. All but one of these appeared perfectly formed, the exceptional egg having an incompletely developed shell. The 10 eggs that were incubated ranged in length from 16.8 mm to 18.8 mm, mean 17.5 mm. In width they varied from 10.1 mm to 10.9 mm, mean 10.4 mm. All eggs spoiled after about 3 weeks of incubation and all contained embryos.

A third female *rufidorsum,* snout-vent length 104 mm, from near El Arco, Baja California, laid 18 eggs on May 12. These had immaculate white, flexible shells. Measurements of these eggs showed a range in length of from 14.1 mm to 15.5 mm, mean 14.6 mm. In width they varied from 10.0 mm to 10.8 mm, mean 10.4 mm.

54 days after being laid the eggs were again measured. Five of the original 18 had spoiled during incubation and were apparently infertile. The remaining 13 eggs varied in length from 16.3 mm to 19.2 mm, mean 18.3 mm. In width they ranged from 12.3 mm to 15.4 mm, mean 14.08 mm. The average increment in length during incubation was 24.5 per cent and in width 35.4 per cent.

Young commenced hatching on July 27 after 77 days incubation. Hatching continued on July 28, 29, 30, August 1 and 4, the last young emerging 85 days from the time the egg was laid. One egg spoiled but contained a well developed embryo. Twelve eggs successfully completed incubation. The young ranged in total length from 59 mm to 70 mm, mean 64.4 mm. Tail length varied from 30 mm to 38 mm, mean 35.5 mm.

Sceloporus undulatus elongatus — A female from 5 miles west of Monroe, Sevier Co., Utah, snout-vent length 77 mm, laid 8 eggs on June 3. These were an immaculate white and had flexible shells. In length they varied from 13.6 mm to 14.1 mm, mean 13.9 mm. Width ranged from 8.3 mm to 8.8 mm, mean 8.6 mm.

After 57 days of incubation the eggs were measured again and found to range in length from 17.9 mm to 19.2 mm, mean 18.7 mm. Width ranged from 12.2 mm to 13.3 mm, mean 12.7 mm. The average increase over measurements when laid was 34.5 per cent in length and 47.7 per cent in width.

The young hatched on August 4 and 5, the incubation period from the date of laying to first hatching being 63 days. These 8 hatchlings had a total length range of from 65 mm to 70 mm, mean 67.5 mm. Tail length ranged from 38 mm to 42 mm, mean 39.9 mm.

Sceloporus occidentalis biseriatus—A female with a snout-vent length of 67 mm from 5 miles north of Descanso, San Diego Co., California,

laid 12 well-formed eggs and one misshapen egg on June 4. The 12 good eggs were an immaculate white in color and had flexible shells. In length they varied from 11.8 mm to 13.0 mm, mean 12.3 mm. Width ranged from 8.3 mm to 8.8 mm and averaged 8.5 mm.

After 65 days of incubation the young commenced hatching on August 7. Four hatchlings emerged on this date, while the remaining eight were all present on top of the sand on the morning of August 8. The total length measurements of these young ranged from 60 mm to 64 mm, mean 61.25 mm. Tail length ranged from 33 mm to 37 mm, mean 34.75 mm.

Another female *biseriatus,* snout-vent length 62 mm, from Alvarado Canyon, San Diego Co., California, laid 5 eggs on June 8. These had immaculate white, flexible shells. On the morning of June 9, the female was dead and found to contain two additional eggs, one of which was not completely formed, having a shell that was yellow in color. The remaining 6 eggs, including one removed from the oviduct of the dead female, were incubated. Two of these spoiled, including the egg removed from the female. The four eggs that completed incubation ranged in length, when first laid, from 12.0 mm to 12.5 mm, mean 12.22 mm. Width varied from 7.2 mm to 7.8 mm, mean 7.52 mm.

The eggs were again measured after 55 days of incubation. Length ranged from 16.1 mm to 16.7 mm, mean 16.27 mm. Width ranged from 11.0 mm to 11.8 mm, mean 11.6 mm. During the period of incubation these eggs had increased 33.1 per cent in length and 54.3 per cent in width.

After 59 days of incubation the young hatched on August 5. Their total length ranged from 56 mm to 60 mm, mean 58 mm. Tail length ranged from 32 mm to 35 mm, mean 33.5 mm.

Urosaurus graciosus — A female, snout-vent length 47 mm, from Borrego Valley, San Diego Co., California, deposited 4 eggs on May 19. These were an immaculate pale-cream color and had flexible shells. The eggs varied in length from 12.9 mm to 13.9 mm, mean 13.3 mm. Width ranged from 6.8 mm to 7.4 mm, mean 7.2 mm.

After incubating for 67 days the eggs were again measured and found to have a length of from 16.7 mm to 19.2 mm, mean 18.25 mm. In width they varied from 9.4 mm to 11.5 mm, mean 10.6 mm. In length these eggs had increased 37.2 per cent and in width 47.2 per cent.

On August 4 a hatchling was found on top of the sand after 78 days incubation. The remaining eggs failed to hatch, but all contained well developed embryos complete with pattern. The single hatchling had a total length measurement of 69 mm and a tail length of 45 mm.

Another female *graciosus,* snout-vent length 48 mm, from Borrego Mt., San Diego Co., California, laid 4 eggs on July 25. These were also an immaculate pale-cream color with flexible shells. The length of these eggs ranged from 11.3 mm to 12.0 mm, mean 11.7 mm. Width varied from 5.7 mm to 6.7 mm, mean 6.5 mm.

After 55 days of incubation, these eggs were again measured and found to vary in length from 13.3 mm to 16.0 mm, mean 14.7 mm. Width measurements ranged from 10.5 mm to 11.1 mm, mean 10.85 mm. The increase in dimensions over those when the eggs were first laid amounted to 26.13 per cent in length and 67.69 per cent in width.

Hatching began September 23 after 61 days of incubation, two young emerging on this date. Another hatched on September 24, and the last

on September 26. The young varied in total length from 67 mm to 70 mm, mean 68.3 mm. Tail length ranged from 44 mm to 46 mm, mean 44.8 mm.

Urosaurus microscutatus — A female measuring 45 mm snout-vent length from Borrego Palm Canyon, San Diego Co., California, laid 1 egg on June 19, two more on June 20 and one on June 23. The last laid seemed imperfectly formed and was thrown out. The remaining 3 eggs were an immaculate yellowish-white in color with flexible shells. These ranged in length from 10.8 mm to 11.7 mm, mean 11.3 mm. Width varied from 6.1 mm to 6.6 mm, mean 6.4 mm.

These eggs hatched August 16 after 59 days of incubation, as figured from the date of first laying to hatching. The young varied in total length from 58 mm to 60 mm, mean 59 mm. Tail length ranged from 35 mm to 37 mm, mean 36 mm.

In all three hatchlings the throat bore a pale yellow-orange central patch of color.

Another female *microscutatus,* also from Borrego Palm Canyon, measuring 43 mm snout-vent length, laid 4 eggs on June 27. These were an immaculate white in color and had flexible shells. They ranged in length from 10.6 mm to 11.3 mm, mean 10.9 mm. Width ranged from 6.2 mm to 6.4 mm, mean 6.3 mm.

After incubating for 51 days, the eggs were again measured and at this time ranged in length from 12.5 mm to 13.4 mm, mean 12.9 mm. Width varied from 8.4 mm to 8.8 mm, mean 8.6 mm. On the average the eggs had increased 18.3 per cent in length and 36.5 per cent in width.

These eggs hatched after 56 days of incubation, the first young emerging on August 21. A second individual hatched the same day, while the remaining two young emerged on August 22. Their total length ranged from 48 mm to 50 mm, mean 49 mm. Tail length ranged from 27 mm to 29 mm, mean 27.8 mm.

All four young had a central throat patch of pale yellow-orange.

Uta stansburiana hesperis—A female from Frenchman's Flat, Piru Creek, Los Angeles Co., California, laid 4 eggs on June 1. These were an immaculate white in color with flexible shells. In length the eggs ranged from 11.4 mm to 12.0 mm, mean 11.57 mm. Width varied from 6.3 mm to 6.9 mm, mean 6.65 mm.

59 days of incubation resulted in a length range in these eggs of from 14.4 mm to 14.7 mm, mean 14.55 mm. Width varied from 10.0 mm to 10.5 mm, mean 10.33 mm. The increment in length amounted to 25.7 per cent and in width 55.3 per cent.

Hatching occurred after 61 days of incubation. The young varied from 50 mm to 55 mm in total length, mean 52.25 mm, while the tail length varied from 29 mm to 33 mm, mean 30.5 mm.

Another female *hesperis,* snout-vent length 47 mm, from Santa Cruz Island, Channel Islands, California, laid a single egg on June 24. On June 28, the female was dead and was found to contain 2 additional eggs, making a total of three for the clutch. One of the latter was ruptured while slitting the female. The other egg removed from the female measured 14.6 mm in length and 7.7 mm in width. The egg deposited by the female measured 13.7 mm in length and 7.6 mm in width. It had an immaculate creamy-white, flexible shell. This egg was incubated, hatching on August 13 after 51 days of incubation. The total length of the hatchling was 62 mm and the tail length 38 mm.

Uta stansburiana stejnegeri—A female from 6 miles west of The Narrows, San Diego Co., California, laid 2 eggs on June 17. These had immaculate white, flexible shells. In length they ranged from 12.7 mm to 12.8 mm, mean 12.75 mm. Width varied from 7.0 mm to 7.3 mm, mean 7.15 mm.

53 days from the date of laying, the eggs were again measured and were found to range in length from 14.5 mm to 15.5 mm, mean 15.0 mm. Width varied from 10.2 mm to 10.3 mm, mean 10.25 mm. The average increase in length was 18.1 per cent and in width 44.3 per cent.

On August 22 the eggs hatched after 67 days' incubation. The total length-tail length measurements of the young were 58-36 mm and 60-37 mm.

Phrynosoma coronatum blainvilli—A female, snout-vent length 72 mm, from San Diego County, California, laid 10 eggs on June 15. These had immaculate white, flexible shells. In length these eggs varied from 13.4 mm to 15.4 mm, mean 14.68 mm. Width varied from 10.2 mm to 10.8 mm, mean 10.43 mm.

On August 15, 62 days after they were laid, the eggs were again measured. At this time 3 of them had spoiled and a fourth had already had the shell slit by the egg tooth of the young within. The remaining 6 eggs of the original 10 varied in length from 14.8 mm to 16.7 mm, mean 16.0 mm. Width ranged from 12.1 mm to 13.2 mm, mean 12.6 mm. The individual that had already slit the shell of its egg had a single egg tooth projecting down and outward from beneath the center of the rostral scale.

On the morning of August 16, all eggs had hatched and the young had reburied themselves in the sand. Total length measurements of the 7 young ranged from 35 mm to 37 mm, mean 36.4 mm. Tail length measurements ranged from 9 mm to 10 mm, mean 9.6 mm.

A second female *blainvilli,* snout-vent length 96 mm, also from San Diego Co., California, deposited a clutch of 21 eggs. The first of these was laid June 2 and from its appearance was judged to be incompletely formed. On June 4 20 additional eggs were found, 5 of these appearing imperfect and probably infertile. The remaining 15 eggs had immaculate white, flexible shells. They varied in length from 12.8 mm to 13.8 mm, mean 13.2 mm. Width ranged from 10.2 mm to 11.1 mm, mean 10.7 mm.

After 65 days the eggs were again measured. One egg had spoiled. The remaining 14 varied in length from 14.2 mm to 15.5 mm, mean 14.8 mm. Width varied from 12.3 mm to 13.6 mm, mean 12.9 mm.

The first egg hatched on August 9 after 67 days of incubation. Hatching continued until August 11. Total length measurements of the young ranged from 34 mm to 38 mm, mean 35.5 mm. Tail length varied from 9 mm to 11 mm, mean 10.2 mm.

These young shed their skins in fragments a short time after hatching. An individual that hatched between 9 and 11:45 a.m. was shedding at 1 p.m. Another found on the surface of the sand at 8 a.m. was shedding at 9:45 a.m.

Phrynosoma platyrhinos calidiarum—A female, snout-vent length 85 mm, from near Blythe, Riverside Co., California, laid 10 eggs on June 13. These were an immaculate yellowish-white in color and had flexible shells. In length the eggs varied from 16.7 mm to 19.2 mm, mean 17.75 mm. Width varied from 10.7 mm to 11.8 mm, mean 11.5 mm.

Within two weeks all eggs had spoiled, but all were fertile, containing small embryos.

Cnemidophorus tigris multiscutatus—A female, snout-vent length 87 mm, from Julian, San Diego Co., California, mated in captivity on May 23 and May 25. On June 16, she laid 3 eggs which were dried out when found. On July 3 she was again observed mating and on July 13 appeared to be gravid. On July 22 she again laid 3 eggs. These were an immaculate white in color with flexible shells. In length they varied from 19.5 mm to 20.8 mm, mean 20.3 mm. Width ranged from 10.9 mm to 11.0 mm, mean 10.93 mm.

After 50 days of incubation the eggs were again measured and the length was found to range from 20.7 mm to 22.7 mm, mean 21.97 mm. Width ranged from 14.4 mm to 15.0 mm, mean 14.8 mm. The growth of these eggs represented an average increase in length of 8.22 per cent and 35.4 per cent in width.

The first egg hatched on October 9, another on October 10 and the third on October 11. The incubation period from the laying date to the date of first hatching was 80 days. The total length-tail length measurements in millimeters of the 3 young were as follows: 110-75; 114-77; 118-82.

The posterior one-half of the tail in all three young was Light Grayish-Violet Blue (Ridgway, 1912, Color standards and nomenclature).

Gerrhonotus multicarinatus webbi—A female, snout-vent length 127 mm, from the City of San Diego, California, laid 12 eggs on June 15. These were an immaculate creamy-white in color with flexible shells. They varied in length from 14.7 mm to 16.0 mm, mean 15.1 mm. Width ranged from 9.5 mm to 10.2 mm, mean 9.8 mm.

The eggs were incubated for 50 days and then measured again. At this time the length ranged from 15.9 mm to 17.5 mm, mean 16.6 mm. Width ranged from 11.2 mm to 13.4 mm, mean 12.3 mm. The average increase in length was 9.9 per cent and in width 25.5 per cent.

The first young hatched on August 4 after 51 days of incubation. Hatching continued on August 5 and August 7. A total of 6 eggs hatched. 4 eggs contained embryos that were not quite fully developed, while the two remaining eggs contained full term embryos. Measurements of the 6 young that hatched plus the 2 full term embryos showed a total length range of from 78 mm to 95 mm, mean 87.1 mm. Tail length varied from 48 mm to 60 mm, mean 54.3 mm.

A second female *G. m. webbi,* snout-vent length 130 mm, from Cardiff, San Diego County, laid 20 eggs on June 20. These had creamy-white, immaculate, flexible shells. They ranged in length from 13.1 mm to 14.8 mm, mean 13.8 mm. Width varied from 9.4 mm to 10.4 mm, mean 9.8 mm.

On August 9, after 51 days of incubation, these eggs began to hatch. Six of the eggs had spoiled during early incubation but were fertile, all containing small embryos. Another egg had been slit by its occupant which had died within. Of the remaining eggs 6 had not yet been slit and were measured. They ranged in length from 13.6 mm to 14.7 mm, mean 14.3 mm. In width they varied from 10.0 mm to 11.8 mm, mean 11.3 mm. These 6 eggs had increased their original measurements an average of 2.43 per cent in length and 15.3 per cent in width.

Seven young hatched on August 9 and 6 more on August 10. These

varied in total length from 85 mm to 100 mm, mean 93.8 mm. Tail length varied from 54 mm to 65 mm, mean 60.0 mm.

The single young that had slit its egg and died had a total length measurement of 73 mm and a tail length of 44 mm suggesting that the slitting of the egg had been premature and had caused death.

ZOOLOGICAL SOCIETY OF SAN DIEGO,
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Incubation Period of Snake Eggs

By C. B. PERKINS

The following list is of snakes whose eggs have hatched at the San Diego Zoo. Incubation takes place in a room with west windows. The temperature at night may fall as low as 64° F. in March (with a maximum of about 80° F. for that time of year) and rises to a high of 93° F. to 95° F. each September. Only eggs from snakes that have bred in captivity are laid during the colder months. The temperature after the 1st of July seldom gets as low as 70° F.

The method used in the hatching of snake eggs may be of interest. The container is a crock 6 inches in diameter and 3 inches deep. A paper towel is folded into a square, thoroughly soaked, and the surplus water squeezed out by hand. This towel is placed in the bottom of the crock and covered with a dry paper towel folded in the same way. The eggs are placed on the towels and the crock covered with a pane of glass. Usually nothing more is necessary. Occasionally the eggs get too dry and may start to shrivel, and a little water is added. The eggs are put in the crocks as soon as possible after they are laid.

Species	*Number of Clutches*	*Longest Number of Days*	*Shortest Number of Days*	*Average*
Alsophis angulifer	3	97	89	93.6
Coluber constrictor mormon	2	64	51	57.5
Diadophis amabilis similis	1			48
Elaphe emoryi emoryi	5	77	72	73.6
Elaphe guttata guttata	1			67
Elaphe vulpina vulpina	1			44
Lampropeltis getulus californiae	31	83	66	71.3
Lampropeltis zonata zonata	1			63
Masticophis flagellum piceus	2	79	76	77.5
Masticophis lateralis	1			94
Naja naja	2	76	69	72.5
Opheodrys vernalis vernalis	1			23
Pituophis catenifer affinis	1			75
Pituophis catenifer annectens	20	77	64	70.3
Pituophis catenifer catenifer	1			66
Pituophis catenifer deserticola	1			66
Pituophis melanoleucus melanoleucus	10	101	59	78.8
Salvadora hexalepis virgultea	1			85
Trimorphodon vandenburghi	1			79

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Terrapene carolina triunguis Winters in the Egg

By CHARLES MYERS

There is little data on the laying or incubation of the eggs of the various forms of *Terrapene carolina,* almost all that is known may be referred to the eastern form. Since Ewing speculated that a small percentage of *Terrapene carolina* may spend the winter in the egg, little seems to have been written on this phase of the life history; consequently I hereby take this opportunity to present a few of my own observations.

On 27 September, 1951, four eggs of *Terrapene carolina triunguis* were uncovered during the course of spading in our garden in St. Louis. One of the eggs was accidentally destroyed and was found to contain a well developed embryo. The other three hatched October 7th and 8th. Of these, one was later killed by our dog.

On 11 October, 1951, two other eggs were discovered in the same location. They were presumably of the same clutch but had been overlooked before. Again one was destroyed while the remaining egg hatched 14 October, 1951.

The above-mentioned eggs were hatched on damp paper at room temperature, and the young turtles kept moderately active all winter. The late hatching dates would indicate that the turtles would have stayed in the egg, or at least in the nest all winter.

On 9 April, 1952, a clutch of four eggs was found not far from where the first nest was uncovered the preceding fall. Three were said to have been "spoiled and covered with tiny bugs," but the remaining one was saved. The shell on this egg was already cracked and the turtle made his escape that night.

It may be interesting to compare carapace measurements taken 12 April, 1952, of the turtles that hatched in the fall of 1951, with the turtle that wintered in the egg and hatched the spring of 1952. The turtles that hatched October 7th and 8th measured 34.91 mm. and 36.61 mm., respectively; that which hatched 14 October, 1951, 38.09 mm. In contrast the individual that had wintered in the egg had a carapace measurement of only 25.55 mm.

I am satisfied that at least a small percentage of young *Terrapene carolina triunguis* may spend the winter in the egg. However, much further observation must be made before we can arrive at generalizations.

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Results of a Herpetological Collection from Eastern Central Mexico

By PHILIP W. SMITH *and* DONALD M. DARLING*

This report is based on a collection of 69 amphibians and reptiles of 20 species from the Mexican states of San Luis Potosí and Tamaulipas. These were collected by the junior author from September 5th to 9th, 1950, and subsequently deposited in the University of Illinois Museum of Natural History, to which all specimen numbers cited in the text refer. Most of the snakes were found DOR during the night and early morning. Very few were found after the first few hours of daylight due to the efficient scavenging of countless numbers of Audubon's Caracara, ***Polyborus cheriway audubonii*** Cassin.

Of particular interest are a range extension for *Agkistrodon bilineatus taylori* and two state records: *Eleutherodactylus natator* for San Luis Potosí and the genus *Trimorphodon* for Tamaulipas.

We are much indebted to Dr. Hobart M. Smith for his critical comments on some of the more puzzling specimens and to Mr. Arthur Loveridge for the loan of comparative material.

Scaphiopus couchii couchii Baird

Three specimens were taken as follows: 19246, 3 miles north of Las Flores; 24872, 6 miles south of Limón; and 24871, 5 miles south of Limón, all in Tamaulipas.

Bufo horribilis Wiegmann

A series of subadults (19241-4) was secured at La Cruz, a small village 41 miles north of Ciudad Victoria, Tamaulipas.

Bufo valliceps Wiegmann

Two specimens (19238-9) from 3 miles north of Las Flores and one (19237) from La Cruz, both in Tamaulipas, are present in the collection. A single specimen (19240) was collected 10 miles west of Ebano, San Luis Potosí.

Leptodactylus labialis (Cope)

One male (19264) was taken 5 miles south of Ciudad de Valles, San Luis Potosí.

Eleutherodactylus natator Taylor

A fine series of eight specimens (19265-6, 24864-9) from 1 mile northwest of Xilitla, San Luis Potosí, is referable to this species. This collection provides the first record of the occurrence of this species in San Luis Potosí and extends the known range approximately 200 miles to the northwest.

These frogs, ranging from 47 to 72 mm. in snout-vent lengths, are at variance with the original description (Univ. Kansas Sci. Bull. 25(17): 385-405, 1938) and a female paratype in that the rear of the thighs of most of our specimens is dark, enclosing many small yellow spots rather than coarsely reticulate, the legs are somewhat shorter, and none possesses a mid-dorsal light line.

The ground color of the living frogs varied from light olive-green to light gray to red-brown. The most distinct markings were the rectangular, interorbital dark marking and the heavy black line over the tympanum.

1954

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The specimens were found sitting on rocks at night on either side of a waterfall.

Smilisca baudinii baudinii (Duméril and Bibron)

Twenty-six specimens are present in the collection from the following localities: 19247-58, 24852-60, 39 miles south of Ciudad de Valles; 19259-60, 1 mile northwest of Xilitla, San Luis Potosí; and 19261-3, 4 miles north of Santa Inés, Tamaulipas.

All except the Xilitla specimens were found calling at night along the side of the road. The Xilitla specimens were found during the heat of the day on large rocks in the middle of a small stream. These frogs were in direct sunlight lying close to the rock with their feet tucked under them and their eyes retracted into their skulls. At a distance of 5 or 6 feet they were impossible to distinguish from the dry brown leaves covering the rocks.

Fig. 1. *Hyla miotympanum.* UIMNH 24863, collected 1 mile northwest of Xilitla, San Luis Potosí. Photo by Darling and Werler, San Antonio Zoological Society.

Hyla miotympanum Cope

Three adult females (24861-3) were taken 1 mile northwest of Xilitla, San Luis Potosí (fig. 1).

Color notes taken for one of the living females were recorded: "Dorsally bright green with numerous indistinct black reticulations which give an over-all effect of dirty green; undersides of forelimbs, sides of body, and upper surfaces of feet grayish-tan; upper jaw and feet with numerous round black specks on gray background; the enamel gray of limbs and venter is revealed only along the margins of the body when the legs are folded in the natural perching position; toe tips, distal portions of upper surfaces of feet, and the underside of radi-oulna, femora, and feet lavender brown; rear of thighs lavender; sides of body grading from green dorsally through gray to lavender ventrally, more conspicuous posteriorly; chin and belly white except for purple flecks on sides of belly and lower jaw; eye red-rimmed."

All three specimens were found during the day near a waterfall. Two were showered continuously by the falling spray, and the third crouched in a depression on the top of a large rock in a stream. These frogs resembled the *Smilisca* mentioned above in that they would keep their eyes retracted to avoid discovery.

Holbrookia texana texana (Troschel)

One male (19267) was secured at La Cruz, Tamaulipas. This specimen, 58 mm. from snout to vent, has 83 ventral scales, 40 dorsals in a head length, and 26 femoral pores.

Sceloporus variabilis variabilis Wiegmann

One adult (19270) is from 14 miles north of Ciudad de Valles, San Luis Potosí.

Eumeces tetragrammus (Baird)

The remains of a specimen (19268) of this species were removed from the stomach of a small Mexican moccasin from 4 miles south of Santa Inés, Tamaulipas.

Boa constrictor imperator (Daudin)

A very young boa (19281) 429 mm. in total length, from 9 miles west of Ebano, San Luis Potosí, and a specimen (24870) 641 mm. in total length, from 3 miles north of Santa Inés, Tamaulipas, are in the collection.

Elaphe flavirufa flavirufa (Cope)

Four specimens were secured as follows: 19273, 1 mile north of Las Flores; 19276 (see fig. 2), 9 miles north of Antiguo Morelos, both in Tamaulipas; 19274, Ciudad de Valles; and 19275, 12 miles east of Ciudad de Valles, San Luis Potosí.

Scutellation data for these four are, respectively: scale rows 26-29-21, 26-28-21, 26-29-21, 26-28-21; ventrals 249, 254, 249, 248; subcaudals 106, 115, 106, 101; supralabials 9-9, 9-10, 9-9, 9-9; body length in mm. 752, 620, 339, 370; tail length in mm. 207, 168, 91, 100.

Elaphe emoryi emoryi (Baird and Girard)

Three specimens were taken in Tamaulipas as follows: 19277, 5 miles north of Ciudad Mante; 19279, 22 miles north of Ciudad Mante; and 19278, ¼ mile south of Las Flores. Scutellation data are, respectively: scale rows 26-29-19, 26-27-19, 26-26-21; ventrals 227, 223, 231; subcaudals 76, 79, 43+; supralabials 8-8 in all; infralabials 11-11, 11-12, ?-?; body length in mm. 348, 685, 720; tail length in mm. 76, 174, 100+. No. 19277 is atypical in pattern, the anterior processes of the first blotch failing to meet in the frontal region.

Fig. 2. *Elaphe flavirufa flavirufa.* UIMNH 19276, collected 9 miles north of Antiguo Morelos, Tamaulipas. Photo by Darling and Werler, San Antonio Zoological Society.

Leptodeira maculata (Hallowell)

Two specimens (19282, 14 miles north of Antiguo Morelos, and 19283, 22 miles north of Ciudad Mante, Tamaulipas) have, respectively: 170, 172 ventrals; 169, 412 mm. body length; 48, 104 mm. tail length. Both have 21-23-17 scale rows; 64 subcaudals; 8-8 supralabials.

Trimorphodon tau tau Cope X *T. t. upsilon* Cope

One male (19284) found DOR 13 miles south of Ciudad Victoria, Tamaulipas, is battered almost beyond discerning the head pattern. There are 21-22-15 scale rows, 217 ventrals, 70 subcaudals, 30 dorsal and 16 tail rhombs. The body length is 539 mm. and the tail is 111 mm. The head pattern seems to consist of a light stripe which bifurcates on the anterior ¼ of the parietals, each prong of which terminates at the rear margins of the frontal plate. A median dark spot within the light stripe is present just behind the bifurcation.

The head pattern, as best it can be made out, thus seems typical of *T. upsilon*. Another specimen (27164) present in the museum from only one mile south of this locality, however, is a typical example of *T. tau* as are specimens recently recorded for nearby localities in San Luis Potosí (Taylor, Univ. Kansas Sci. Bull. 33(2):169-215, 1949). *T. tau* and *T. upsilon* are known to differ only in the nature of the head pattern; and, although specimens possibly referable to both these forms are extant from the same general locality, the known ranges are in general complementary, *tau* occurring at the periphery of the Central Mexican Plateau and *upsilon* on the plateau proper. We provisionally regard these forms as subspecies and consider the Tamaulipas specimens intergrades.

These specimens appear to be the first record of the occurrence of the genus in Tamaulipas.

Tropidodipsas sartorii sartorii Cope

A badly smashed male (19280) found DOR nine miles north of Ciudad de Valles, San Luis Potosí, has 15-16-15 scale rows, 171 ventrals, 61 subcaudals, 14 body rings which are flecked with black dorsally, 5 tail rings, a body length of 447 mm., and a tail length of 131 mm. Before discoloration by preservative, however, the light rings were yellow rather than red. Taylor (Univ. Kansas Sci. Bull. 34(13):814, 1942) records a specimen from 1.8 miles north of Valles, San Luis Potosí, with pale orange rings. The color of these two examples and the low ventral count of the present specimen suggest *T. s. annulatus* (173 ventrals in the one male *annulatus* known, 176-185 ventrals in four male *sartorii* available). The light rings, all but one of which are complete ventrally, on our specimen are decidedly less even and regular than in five other *sartorii* available for comparison, and in this respect our specimen shows no similarity to *T. s. annulatus*.

Smith (Proc. U.S. Nat. Mus., 93:495, 1943) expressed the possibility that additional material might result in discerning more than two subspecies in this species. It is probable that a race in northern Mexico with fewer and yellow bands and a low ventral count may exist and can be described with the accumulation of more specimens accompanied by color notes.

Thamnophis sauritus proximus (Say)

One specimen (19272) collected 2 miles south of Limón, Tamaulipas, has 19-19-17 scale rows, 158 ventrals, 91 subcaudals, 8-8 supralabials, a body length of 399 mm., and a tail length of 165 mm.

Agkistrodon bilineatus taylori Burger and Robertson

A young male (19271) taken 4 miles south of Santa Inés, Tamaulipas, provides the third locality for this recently described subspecies and extends the known range more than 100 miles to the south. Scutellation data are as follows: scale rows 23-23-21; ventrals 132; subcaudals 56, the last eleven of which are divided. The head pattern is nearly identical with that of the type. The body length is 287 mm. and the tail, 63 mm.

Crotalus atrox Baird and Girard

One specimen (19285) was taken 27 miles south of Ciudad Victoria, Tamaulipas.

The Pulmonary Respiratory System of Salamanders

By WILLIAM A. HILTON

The glottis is a small, longitudinal, slit-like opening in the floor of the pharynx at a variable distance back from the tongue. It leads into the laryngotracheal chamber which is supported by a series of semicircular cartilages along the sides. The first and largest pair, just back of the glottis, is usually designated as the arytenoid. The bronchi are short wide passages leading directly into the lungs. The lung sacs are thin-walled, rather simple in structure, sometimes slightly sacculated and of variable length. Quite frequently one is longer than the other.

Henle (1939) was the first to investigate this region. He described a pair of cartilaginous rods on the sides of the respiratory tube of *Proteus* which he considered as primitive. In more advanced conditions these divide into an inferior and superior part, the superior the artenoids from which may arise the cartilages of Santorini of mammals, according to him. The cricoids and tracheal rings of higher groups were considered to come from the lower parts.

Others who have described this region are Balfour (1881), Wiedersheim (1886), Hertwig (1890). In 1892 Wilder suggested that the lateral laryngeal cartilages represent the 5th branchial arch of the elasmobranchs and the M. dialator laryngis is homologus with the dorsal segment of the muscles of the region. The M. constrictor laryngis was considered as a continuation of the circular muscle of the alimentary canal and the tracheal region with a later independent origin from surrounding connective tissue. Gegenbauer (1892) considered the whole lateral mass of cartilage was derived from the fifth arch. Goppert (1894) opposed the origin of the M. constrictor laryngis from the intestinal muscle, because this last is smooth muscle and the structure in question was striated. He considered the M. c. laryngis as arising from M. levator arcuum V, but agreed with other parts of the theory. In 1896 Wilder changed his views about a double origin for the lateral cartilages and the derivation of the laryngeal muscle from the alimentary canal and accepted Gegenbauer's views. In 1898 Goppert discarded his former view that the ventral laryngeal muscle was derived from transverse muscle of the 4th arch and considered it serially homologous with, and representing the M. t. ventralis V. In 1901 Drüner suggested that the laryngeal skeleton and muscles are not derived from the fifth but the sixth or some more caudal arch. Wiedersheim in 1904 considers the lateral cartilage of Amphibia has no connection with the visceral arches, but is merely a supporting structure developed because of muscular pressure. Edgeworth, 1920, confirms Wiedersheim's idea upon embryological evidence.

The muscles of the larynx are as follows:

M. dilator laryngis. This arises from dorsolateral fascia of the neck region lateral to the cucullaris. It passes ventrally about the pharynx medial to the thymus gland to be inserted on the side of the laryngeal cartilage, sometimes by a tendon. It is supplied by branches of the 10th cranial nerve. It dilates the larynx and opens the glottis. It is often a single narrow band. A part of its fibers may run to the trachea, but a special dilator trachae is split off, according to some, in *Necturus, Proteus, Siren* and *Amphiuma.* I found tracheal muscle fibers in these and also in *Cryptobranchus* adult.

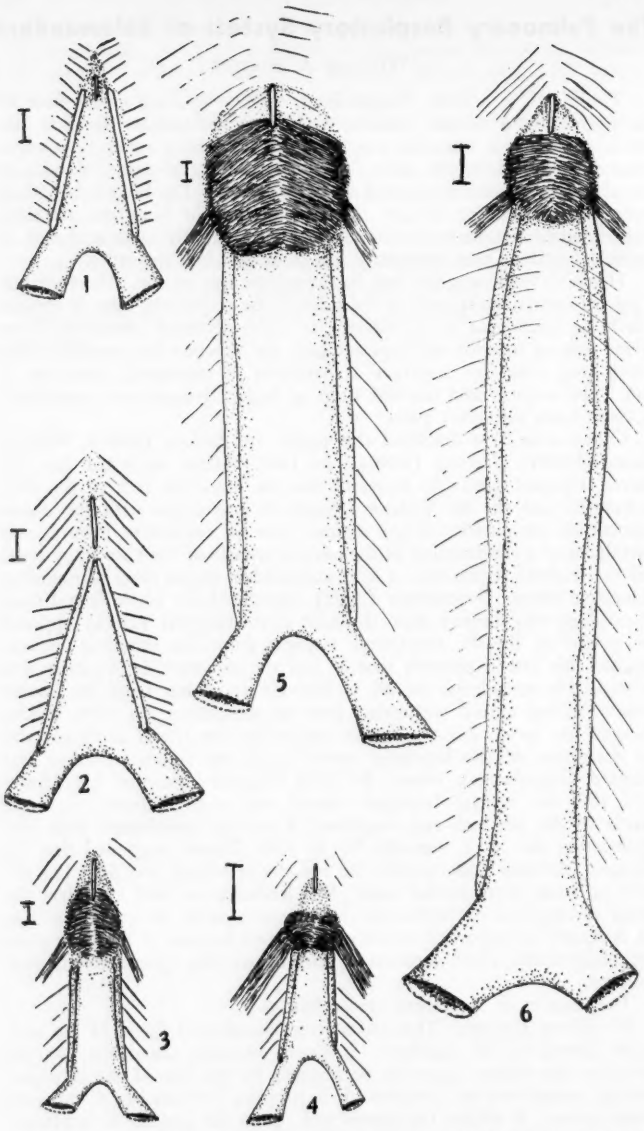

Fig. 1. Surface views of larynx and trachea of salamanders. Glottis shown as a slit. Laryngeal and tracheal muscles shown as lines out at sides. Scales equal to one mm. 1. *Proteus*. 2. *Necturus*. 3. and 4. *Siren*. 5. *Cryptobranchus*. 6. *Amphiuma*. All are adults but 3 and 4 which are young.

M. laryngeus dorsalis and ventralis. On each side in some larvae fibers in one or two bundles run to the dilator laryngi. They apparently act as dilators of the larynx. In many forms, at least, they do not remain as such in the adult stage.

M. cephalo-dorso-subpharyngeus. This muscle arises from fascia on the side of the neck and on each side is attached to the middle line of the pharynx in front of the larynx. It is supplied by the tenth nerve. It restricts the pharynx. In many cases its fibers are inserted farther back, some strands often mingling or overlapping laryngeal fibers.

M. constrictor laryngeus. This muscle usually quite completely surrounds the larynx, its fibers somewhat interrupted by the dilator muscle insertions. Sometimes it seems divided into dorsal and more ventral divisions as well as several separate regions or bundles from one end to the other, or perhaps these might be considered as zones. It is better developed in the adult than in the larva. *Necturus, Proteus* and *Siren* are said to lack this muscle. In a young *Siren* specimen which I have examined it seems to be represented, although perhaps more mature specimens would not show it. In *Necturus* the glottis in the adult is 2 mm long; in *Proteus* 1.5 mm; *Cryptobranchus* of 270 mm, 2 mm; in a larval *Cryptobranchus* of 34 mm, .5 mm; *Amphiuma* of 600 mm total length, 2.5 mm; in a Hynobid, 1.5 mm; *Dicamptodon* 2 mm; *Rhyacotriton* adult .5 mm; *Ambystoma texanum* .8 mm; *A. talpoideum* 1.5 mm; *A. maculatum* larva of 34 mm, .5 mm, adult 1.75 mm; *Triturus torosus,* 1 mm; *T. cristatus* 2 mm; *Pseudobranchus* of 115 mm length, 1 mm.

The larynx and trachea are the longest in the larger specimens such as full grown *Amphiuma, Cryptobranchus* and probably *Siren.*

The laryngeal cartilages differ somewhat in different forms. The tracheal tubes in almost every case examined consisted of a membraneous tube strengthened along the side by a cartilage rod which might be made of separate parts and with median extending processes of cartilage. Only in some larvae and *Proteus* was the laryngeal cartilage continuous with the trachea although it was almost in that condition in *Necturus.* The tracheal cartilages of *Necturus* were found to have enlargements at several points. In *Cryptobranchus* the lateral cartilaginous supports for the tracheal vessel had fusions across the middle line by means of cartilaginous strands. In *Proteus* although the trachea and larynx had the cartilage one piece on a side, there was indication of several separate cartilaginous parts along the broncheal tubes.

When properly demonstrated, a very close network of small vessels is found in the wall of the lung.

SUMMARY

All the families of salamanders possessing lungs were studied. The Plethodontidae having no lungs were not considered. The simplest condition of laryngotracheal cartilage where on each side there is one continuous cartilage was found in *Proteus* and *Necturus* young and in the larval condition in early stages. The cleavage into separate divisions on each side is indicated or marked in most adults. The muscles when well developed are of about the same type in all. The lungs in *Necturus, Cryptobranchus, Amphiuma* and *Siren* are quite simple sacs, but when the capillaries are demonstrated they are seen as remarkably close networks. In some of the Salamandridae and Ambystomidae there may be a considerable indication of sacculation in the lungs.

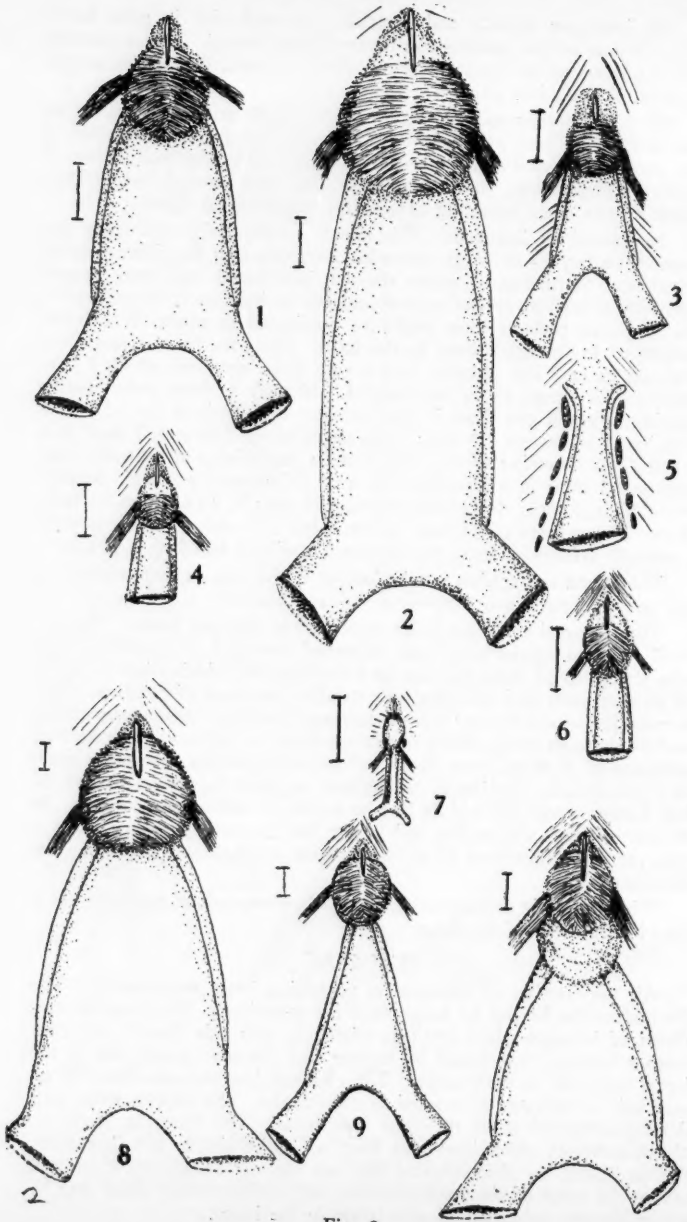

Fig. 2

Fig. 2. Larynx and trachea of salamanders. All are surface views but 5 which is an optical section. Scale equals 1 mm. 1. *Salamandrella* of Hynobiidae. 2. *Ambystoma maculatum.* 3. *Pseudobranchus.* 4. Larval *A. maculatum.* 5. Larva of *Rhyacotriton,* showing separate plates of cartilage along sides. 6. Adult *Rhyacotriton,* not all the tracheal region shown. 7. Larval *Triturus torosus* of 34 mm. 8. Larval *Dicamptodon.* 9. Adult *Triturus viridescens.* 10. Adult *Dicamptodon.*

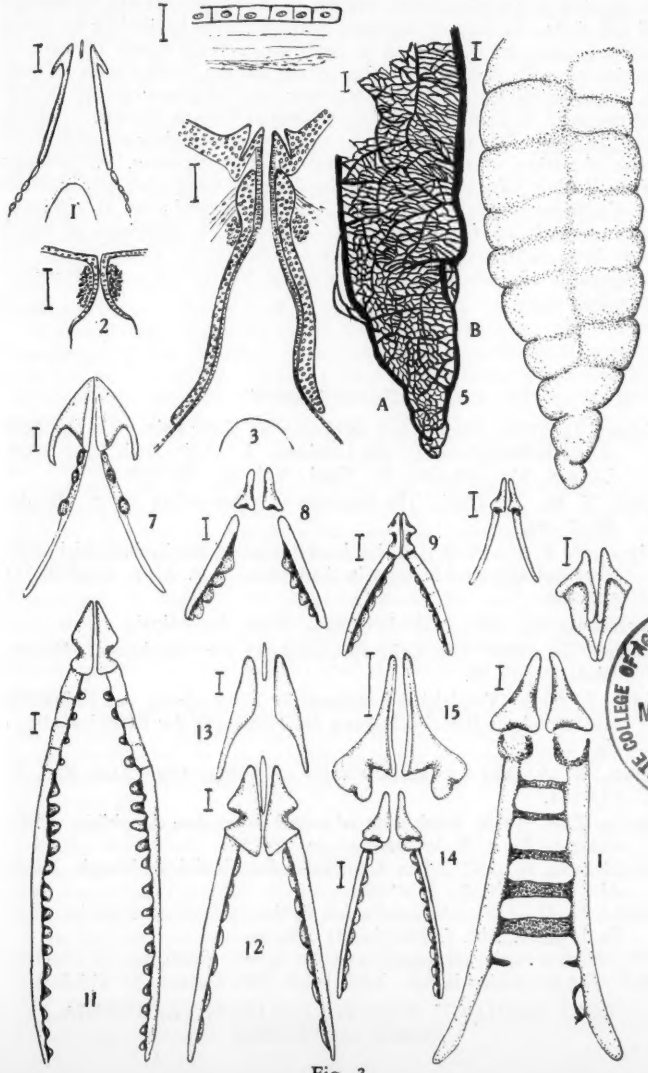

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Fig. 3

Fig. 3. Larynx, trachea and lung structures of salamanders. The scale equals 1 mm. except in 2., 3. and 4. 1. Laryngeal-tracheal cartilages along the sides of bronchial tubes in young *Ambystoma maculatum*. 2. Longitudinal section of larynx and trachea of a larval *A. maculatum* of 15 mm total length. Either side of laryngeal region is precartilage for respiratory passage. Scale equals .05 mm. 3. Longitudinal section through continuous laryngo-tracheal cartilage of *A. maculatum* larva of 21.5 mm. Either side of opening of the glottis little notches in the epithelium suggest vestiges of gill clefts. At sides of laryngeal cartilage region beginnings of dilator and restrictor muscles show at an early stage. Scale equals .05 mm. 4. Section of *Ambystoma* lung, lining cells at the top. Scale equals .01 mm. 5. Blood supply tip of lung of *Necturus*. A, pulmonary artery. B, pulmonary vein. 6. Surface view of tip of lung of *Triturus torosus*. 7. Laryngeal cartilages of young *Ambystoma* with cartilages slightly separated from those of trachea. 8. Cartilages of small adult *A. tigrinum*. 9. Cartilages of small adult *Salamandrella*. 10. Cartilages of small adult *Rhyacotriton*. 11. Cartilages of adult *Amphiuma*. 12. Cartilages of adult *A. tigrinum*. 13. Laryngeal cartilages of adult *A. tigrinum*. 14. Cartilages of young adult *Siren*. 15. Laryngeal cartilages of adult *Siren*, after Drüner. 16. Cartilages of *Cryptobranchus*. 17. Laryngeal cartilages of *Cryptobranchus*, after Drüner.

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DEPT. ZOOLOGY, POMONA COLLEGE, CALIFORNIA

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Terrapene carolina major in Arkansas

By HOBART M. SMITH* AND OTTYS SANDERS**

A subadult male *Terrapene carolina* secured by the junior author and his wife on April 27, 1952, at a locality 7 miles east of De Queen, Sevier Co., extreme southwestern Arkansas, possesses characteristics which indicate that at least certain prominent characteristics of *T. c. major,* which is generally thought of as a coastal race, extend northward in the populations of the major river valleys at least into southern Arkansas. On the basis of a single specimen only a tentative guess may be made of the nature of the population as a whole in a given area, especially in consideration of species as variable as *T. carolina.* Regardless of the nature of future samples from the area represented by the present specimen, however, the conclusion can hardly be avoided that at least intergradation exists in this area between *T. c. triunguis* (Agassiz) and *T. c. major* (Agassiz); even this heretofore has not been a known possibility.

The single example appears, as a matter of fact, to be intermediate, and therefore probably representative of an intergrade population, between the two subspecies named; it resembles *T. c. major* perhaps more conspicuously than it does *T. c. triunguis,* and therefore possibly indicates a preponderance, in its natural population, of *T. c. major* characteristics. We accordingly place it tentatively with the latter subspecies.

The specimen is a male (Univ. Ill., Mus. Nat. Hist. No. 28646) measuring 109 mm. in length of carapace, 89 mm. in width of carapace, and 52 mm. in height. It has a prominently light-marked carapace, numerous light spots on anterior surface of forelimbs, light-spotted head, light plastron with dark suffusion only about the seams and only three toes. The rear edge of the carapace is broadly scooped and flared, as is also the anterior edge.

The external characters distinguishing this race are, according to Carr (Handbook Turtles, 1952, pp. 150-151), (a) large size, (b) flaring of carapace, (c) narrow, straight-sided carapace, (d) dark carapace and plastron, (e) dark head and limbs, and (f) four toes.

A series of 8 specimens from southern Mississippi where typical *T. c. major* is certainly to be expected, shows that size, number of toes and flaring of carapace may be rather constant; the shell proportions and color of shell and soft parts vary greatly, although none possess the extreme of light markings on head and forelimbs that *T. c. triunguis* possesses.

The Arkansas example resembles *T. c. triunguis* in number of toes, and in extent of light marking on head and forelimbs; in flaring of carapace and extent of pigmentation of carapace it resembles *T. c. major.* The flaring is extremely pronounced, however, as in extreme examples of *T. c. major.*

A single Texas example of *T. c. major* (Pine Island, Jefferson Co.) resembles the present one, although it is even closer to *T. c. triunguis,* having more yellow on the carapace, more light areas on the head, and less pronounced flaring of the carapace. Both differ markedly from all *T. c. triunguis* examined (21 at present available) in degree of flaring of the carapace, but both possess 3 toes. It seems likely that both areas represented lie within a zone of intergradation between these two subspecies.

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The Significance of Non-Sexual Dichromatism in Snakes of Western United States

By HOBART M. SMITH

The existence of several striking examples of dichromatism in western snakes has been a puzzle to me for several years. Although some special significance would seem to be indicated, so far as I am aware no definite explanation for it has been proposed.

That any unusual abundance of dichromatism does occur in snakes in western United States may rightly be questioned. The fact does remain that at least five species and subspecies are clearly dichromic, and two pairs of others are, if not dichromic, at least very similar except in patterns, which do differ markedly between the two supposed species of each pair. There is certainly a basic similarity between these two groups. Clearly dichromic are *Sonora semiannulata* (banded and unicolor, no intermediates), *Lampropeltis getulus californiae* and two related subspecies (striped and cross-barred, intermediates existing), *Masticophis flagellum frenatus* (dorsum entirely or not at all black, intermediates existing). Species pairs include *Phyllorhynchus decurtatus* and *P. browni*, *Rhinocheilus lecontei* and *R. antonii*. Still other pairs of species and subspecies seem to fit into the same general pattern, but direct evidence is lacking. Some exhibit dimorphism as well as or instead of dichromatism (which in a real sense is morphological), but this should in itself make no exception to the line of reasoning for pattern.

A summary of the pertinent considerations follow.

1. Differences in contiguous populations within single species having at least a medium degree of vagility involve characters adaptive in nature. This generalization seems to be firmly established, although its application to populations characterized by either extreme in vagility may be questionable.

2. Differences in non-contiguous populations within single species having at least a medium degree of vagility may or may not involve features adaptive in character. The features may be of "drift" nature.

3. Where differences in adaptive characters exist between contiguous populations, the environmental differences act to hinder blending of the populations concerned; where non-adaptive characters are involved (between non-contiguous populations), environmental differences would not necessarily hinder blending of populations were they to be brought into spatial proximity.

4. Differences in either adaptive or non-adaptive characters may, of course, be of either a blending or discontinuous type.

5. Discontinuous differences in non-adaptive pattern characters, between the two non-contiguous populations may, upon mergence of the populations, result in formation of a dichromic population, in which the two forms may be strikingly different.

6. Discontinuous differences in adaptive characters (as of pattern) between two populations, contiguous or not, would not be expected, upon mergence of the populations, to result in a single polychromic population, but rather in either (a) domination by the more successfully adapted type and eventual elimination of the less successful one, or (b) improvement of isolating mechanisms permitting geographic coexistence, or (c) continued existence of the forms in contiguity.

7. The unusual abundance in western United States, as compared with other parts of the continent, of dichromic snakes may be a result of the abundance of geological phenomena facilitating isolation of groups that accumulate unique combinations of non-adaptive characters in a drift fashion, as opposed to the more usual, adaptive differentiation (in contiguous areas) that less readily can lead to formation of polychromes.

8. The rarity of dichromic species of herptiles exclusive of snakes is not readily explicable. It may be due to the relative abundance in them of means whereby reproductive incompatibility might be effected; drift characters in them should stand a better chance of involving some deterrent to free interbreeding. On the other hand it might be due to possession of a high degree of somatic as well as genetic tolerance as in *Bufo* et al., rather than the low degree of tolerance characteristic of most vertebrates, such as amphibians like *Rana*.

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A BEHAVIORAL ANALOG OF BRILLAR EYELIDS IN SPECTACLED GECKOS.—Geckos have long been thought to be unique among lizards in lacking eyelids, except of course in the small group of lidded genera formerly placed in the subfamily Eublepharinae. Bellairs (1948. The eyelids and spectacle in geckos. Proc. Zool. Soc. London, vol. 118, part 2: 420-425, fig. 1, 2) has recently shown, however, that such is not the case: the several genera examined of the "Gekkoninae" (*Stenodactylus, Ptenopus, Hemidactylus*) all possess a tertiary spectacle (or "brille") like snakes and like the several genera of lizards with well-developed eyes but no mobile eyelids (Xantusiids, some Teiids, Scincids, Pygopodids, etc.). The structure appears to be homologous throughout. "Eublepharids" lack the spectacle, but have functional lids. The very lidlike structures of *Ptenopus* are not true eyelids but secondary specializations of uncertain value. They are movable to a certain extent. Perhaps the degree of approximation of spectacle and cornea may be correlated with the development of rudimentary secondary eyelids from the circumorbital fringe ("extra-brillar" fringe) which is regularly present with the brille. The figures of *Hemidactylus* (in Bellairs, A. d'a., and Boyd, J. D. 1947. The lachrymal apparatus in lizards and snakes.—I. The brille, the orbital glands, lachrymal canaliculi and origin of the lachrymal duct. Proc. Zool. Soc. London, 117: 81-108), *Stenodactylus and Ptenopus,* with increasingly well developed brillar fringes, terminating in the last with secondary or "brillar" eyelids, suggest an increasingly close juxtaposition of cornea and spectacle. Fusion, or an approach toward it, may require a compensation of some sort. Secondary lids may be such a compensation. Whether they actually are compensatory in this sense or not, the exaggerated extra-brillar fringes presumably are of importance chiefly in protecting the spectacle itself. No similar structure is known in other spectacled vertebrates.

The spectacle of *Sphaerodactylus* has never been studied but it is presumably like that of most other geckos. As in most other genera of the family, there are no brillar (secondary) eyelids, although the brillar fringe does exist. No special morphological structure protects the spectacle. There may be a behavioral protective device, however, as indicated by a peculiar habit of an example of *S. notatus* recently kept

in captivity. On numerous occasions this individual has been observed when quiescent to protrude the tongue in a most peculiar manner quite different from the lapping, exploratory movement common to all lizards and also used by this species. The tongue slips out between the jaws and slides in close contact with the outer surface of the head directly dorsad or ventrad, at times only licking the 'lips', but at other times also wiping the eye. There is no anterposterior swiping of the 'lips', but instead a direct protrusion and withdrawal. The phenomenon is peculiarly reminiscent of movement of a planarian as the thin flat, semitransparent tongue suddenly emerges and as suddenly disappears, following contours of the head as it moves. It is a slow yet elusive, inconspicuous movement of less than a second's duration. Possibly the behavior serves to moisten the eye as well as to free from its surface any extraneous foreign matter. Whether it is a habit restricted to this genus or of general occurrence in geckos with immobile lids remains to be determined, inasmuch as no similar observations have, to my knowledge, been noted previously for any species.—HOBART M. SMITH, Department of Zoology, University of Illinois, Urbana.

A New Whiptailed Lizard (Genus *Cnemidophorus*) from Mexico

By WILLIAM B. DAVIS* *and* HOBART M. SMITH**

For many years the existence in the Balsas Basin of Puebla, Morelos and Guerrero of two size-groups of large *Cnemidophorus* has remained a puzzle. The co-existence there of a giant form and one of moderate size is paralleled in part by the situation in the Santa Catalina Mountains of southern Arizona, where "giants" occur at least occasionally in a population whose adults are chiefly of moderate size. The Mexican situation differs from that of Arizona at least to the extent that the two size groups are of approximately equal abundance.

All authors treating the Balsas Basin populations have concluded that but one species (and subspecies) actually is involved. Gadow (1906: 363-367, fig. 83), the first author with large series of known provenance, named the population *C. mexicanus balsas*. Burt (1931) regarded it as a part of *C. sexlineatus gularis*, and Smith (1949) recently pointed out that Gadow's *balsas* is identical with *C. sacki* Wiegmann, the earliest described form of the so-called "gularis" group.

All authors have been handicapped by acquaintance chiefly with series obtained during summer months, when all individuals are at least half-grown. Juveniles simply are not encountered between June and August, as extensive and independent field work by both present authors and their associates verify. Adults and sub-adults are readily separable on the basis of a number of characters into two groups, but the crucial evidence needed for the juvenile stages perforce has been conspicuously absent.

It was then with no small astonishment that the junior author encountered during the winter months spent in Morelos and Guerrero (January and March, 1939) absolutely no large individuals, despite extensive field work. Numerous juveniles, on the contrary, were obtained. Presumably the eggs of these lizards hatch after most summer collectors leave—perhaps in September—and the adults must thereafter enter a period of aestivation or, more probably, hibernation from which they do not emerge until the warm summer months.

Provided with juveniles for the first time in adequate series, we now have available sufficient material to indicate clearly the status of the populations of the area in question. Contrary to former belief, we find that actually two well-defined species co-exist there. One is large (snout-vent length in males 100-140 mm.) with a distinctly tessellated or reticulated dorsal pattern, relatively small polygonal scales on the posterior surface of the forearm, large number of femoral pores (20-25, averaging 22), and relatively few scales around the tail (20-24 on the twentieth whorl from the vent). The other is smaller (snout-vent length in males, 83-105 mm.), with a striped or tiger dorsal pattern; conspicuous white spots on the rump, base of tail and thighs in old specimens; a row of enlarged scutes on the posterior surface of the forearm; a relatively small number of femoral pores (14-20, averaging 17.5); and a larger number of scales (22-27, averaging 24) on the twentieth whorl of the tail.

In addition to these morphological differences, examination of the gonads indicates a difference in the breeding cycle. Most of the females

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of the small form were gravid and most of the males had slightly enlarged testes in late July and August, whereas in the large form only one of 17 females taken then was gravid (collected July 28) and none of the males had enlarged testes. Three females of the larger form taken in early June, however, were all gravid. One contained four eggs 4 mm. in diameter, one seven eggs 10 mm. in diameter, the other eight eggs 8 mm. in diameter. The testes of males taken in early June were enlarged. These observations point toward physiological as well as morphological differences.

Like other authors treating the forms of *Cnemidophorus* of this group in the Balsas Basin, Gadow (1906) had specimens of both species among the types of his *Cnemidophorus mexicanus balsas,* as is clearly indicated by the table of variation (1906:366). The lectoholotype selected by Smith and Taylor (1950:181), from Cuernavaca, Morelos, is British Museum of Natural History No. 1946.9.8.20 (formerly 1906.6.1.71), and we adhere to that selection. Through the courtesy of Dr. Doris Cochran and Mr. J. C. Battersby we have been able to examine a photograph of the lectoholotype, which is obviously referable to *C. sacki sacki.*

None of the other names proposed for Mexican *Cnemidophorus* appear to be referable to the larger form we have distinguished. This, despite uniform confusion with *C. sacki* in the past, we regard as genetically distinct from the latter and, accordingly, of specific rank. In accordance with the information available, we name the giant form

CNEMIDOPHORUS GIGAS sp. nov.

Holotype.—Adult female, No. 6804, Texas Cooperative Wildlife Collection, from three kilometers northeast of Puente de Ixtla, 3000 ft., Morelos, Mexico, collected by James R. Dixon, August 19, 1950, original No. 726.

Paratypes.—Morelos: 3 km. NE Puente de Ixtla, 3000 ft., 2 females (TCWC 4078, 6805); Alpuyeca, 4000 ft., 10 males, 7 females (TCWC 4027-29, 4034-41 and UIMNH 16826, 16828, 16833, 16835-6); Laguna Rodeo, 3500 ft., 4 males, 2 females, (TCWC 4026, 4030-33 and UIMNH 16838); 6 mi. W Yautepec, 4500 ft., 2 males, 4 females (TCWC 6809-15); 12 km. NW Axochiapan, 3500 ft., 12 males, 4 females (TCWC 6817-32); Temilpa, 3300 ft., 1 male, 2 females (TCWC 6806-8); Cuernavaca, 5 juveniles taken Jan. 21-24, 1939 (UIMNH 30508-12); 5 mi. S Cuernavaca, 1 juvenile taken Jan. 26, 1939 (UIMNH 30513). *Puebla:* Matamoros, 1 male (TCWC 6816). *Guerreros* 8 km. N Taxco, 5500 ft., 1 female (TCWC 7517); 17 km. S Taxco, 4000 ft., 10 males, 2 females (TCWC 7505-16). All the above specimens are in the Texas Cooperative Wildlife Collection and the University of Illinois Museum of Natural History.

Diagnosis.—A large *Cnemidophorus* with 4 supraoculars, 8 rows of belly scales, small polygonal scales on posterior surface of forearm, enlarged scales preceding gular fold, 20-25 femoral pores, the two series separated by 4 or 5 (ave. 4.1) scales, and 20-24 scales around the tail on the twentieth whorl. Ground color of upper parts in adults olive brown to olive green reticulated with black, the reticulations sometimes forming narrow, broken, irregular cross bars; broad, but usually indistinct, blackish dorsolateral stripe from above ear to near femur, below this a series of blackish spots or irregular vertical bars or a dark longitudinal stripe from near axilla to groin; top of hind legs reticulated, not spotted with white; top of head usually solid brown or greenish olive, paler on

snout; underparts in both sexes usually bluish, heavily marked with blackish on the anterior or lateral parts of each belly scale involved, the black markings in most specimens extending forward to gular fold; underside of tail usually heavily marked with black; throat in males usually pinkish in life, pale bluish in females. Sexually mature subadults are characterized by numerous light spots arranged more or less in rows on the dark background of sides and dorsolateral areas, one row below lateral light stripe, two rows between lateral and paravertebral stripes and two incomplete rows beteen paravertebral stripe and mid-dorsal line; six distinct light grayish blue stripes discernible, the middle pair extending from nape to about the mid-region; lateral stripes extend forward through ears onto sides of head under eyes; throat pale bluish. Juveniles superficially resemble young *C. s. sacki* but lack the continuous dark band inside the paravertebral stripes and have small polygonal scales on back of forearm.

Comparisons.—Differs from *C. deppei* and *C. guttatus,* both of which occur in the same general geographic region, in having 4 rather than 3 supraoculars, and in numerous details of color pattern. Differs from *C. sacki* (from Balsas Basin), with which it previously has been confused, in much larger size, snout-vent length in males 100-140 mm., in females, 90-124 mm., rather than 83-105 mm. and 69-91 mm., respectively; posterior surface of forearm with slightly enlarged polygonal scales rather than with a series of considerably enlarged scales or broad scutes; femoral pores more numerous, 19-25 (average 22.4 in 45 specimens) rather than 14-20 (average 18 in 32 males, 17.3 in 24 females) and the two series approach each other more closely at the mid-line (separated by 4 scales rather than 6 or 7); no white or yellow spots on rump and upper surface of hind legs; fewer scales around tail (20-24, average 21.3 in 45 specimens) on twentieth whorl rather than 21-27 (average 24.2 in 66 specimens); upper parts of old specimens tesselated or reticulated rather than tiger barred or striped. Adult males of *C. sacki* have a wider and brighter reddish head than *C. gigas,* and there are several other less tangible differences between the two species in scale characters not mentioned. Also, as pointed out above, the breeding season occurs earlier in the year—May and June.

Remarks.—The difference between these two species appear to be numerous rather than few as might be expected. If regarded as siblings, as they may well be, the general observation that such species possess actually as many as if not more differences than other related species is well borne out.

That *C. gigas* may prove eventually to be related sub-specifically to one or more of the large forms in southern Mexico currently referred to the species *C. sacki* has received careful consideration. The problem of the status of these forms is, however, extremely complex and will require exhaustive investigation to permit proper solution. We have nevertheless examined sufficient material to verify that none of the names available for these giant races can be applied to the population here named *C. gigas.*

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RANGE OF *MALACLEMMYS TERRAPIN RHIZOPHORARUM ON THE WEST COAST OF FLORIDA*—According to Carr (Handbook Turtles, 1952:177) the range of the subspecies *M. t. rhizophorarum* is the Florida Keys westward at least to the Marquesas Keys, and intergradation occurs with *M. t. macrospilota* in Florida Bay. The discovery of a typical male *rhizophorarum* (now in my own collection), found March 19, 1952, on the beach at Key Island south of Naples, Florida, suggests that intergradation must extend northward at least to this area, for only through the recorded occurrence in the vicinity of *M. t. macrospilota* could this individual be treated as representing other than a population of typical *M. t. rhizophorarum*. It is possible, of course, that the specimen is an accidental immigrant from more southern localities into an otherwise pure population of *M. t. macrospilota*.

The Naples specimen measures 102 mm in carapace length, 85 mm in plastron length, 20 mm in tail length.—WM. R. JOHNSON, JR., Palm Beach, Fla.

AN ERYTHRISTIC *PLETHODON C. CINEREUS*.—On April 14, 1952, I collected 8 red-backed salamanders under stones and debris in my backyard. One of these was a large female (snout-vent length 50 mm.) which was immediately distinguishable from others by reason of extensive redness and lack of the usual distinct dorsal stripe. A faint dorsolateral dark stripe was evident on each side, but it was nearly obscured by the red pigment. The reddish color extended down to about the mid-lateral line of the abdomen, and to a point slightly ventral to the bases of the forelegs. On the head the red coloration extended downward to include the entire angle of the jaws, then blended quickly into the normal light grayish color of the gular region. The tail had been lost recently at a point 13 mm. posterior to the vent, but it appeared to have a more normal distribution of the red pigment than the rest of the body, the dark dorso-lateral stripes being only slightly suffused with red. Excessive dark pigment seemed to have collected near the wounded stump of the tail at a point just ventral to the normal dark stripe.

Reed (1908 Am. Nat. 42:460) describes many degrees of erythrism for this species, and says that erythristic specimens are common. Barbour (1914 Copeia No. 10, pp. 3-4) also describes erythristic specimens. Bishop (Handbook of Salamanders) does not mention erythrism, nor could I find any reference to erythrism in *Plethodon* in any issue of Biological Abstracts. I wondered if the amputated tail could be correlated with the excessive redness of the body, so pinched off the tail of a normal specimen. This one did not alter its body color over a period of a week, which would indicate that the erythrism is not an abnormality associated with regeneration. This was as anticipated, since Reed (loc. cit.) shows figures of erythristic specimens with tails intact.—L. M. BARTLETT, Department of Zoology, University of Massachusetts, Amherst, Mass.

A Notable Specimen of the Pecos Skink

By BRYCE C. BROWN

Only four specimens of *Eumeces taylori* Smith have been reported in the literature. I am indebted to Dr. Charles Walker for bringing to my attention an additional specimen in the University of Michigan Museum of Zoology.

The Pecos Skink was first discovered by Mosauer (Occ. Pap. Mus. Zool. Univ. Mich. No. 246, 1932, pp. 1-18, pl. 1, fig. 3) in the Guadalupe Mountain Region of New Mexico and Texas during the summer of 1930. He found the first specimen (UMMZ 70103, a juvenile) in the flat, humid bottom of Dark Canyon (altitude about 5,500 feet) some 40 miles west of Carlsbad, Eddy County, New Mexico. Later on the same trip near Frijole, Culberson County, Texas at an altitude of about 6000 feet he collected an adult female (UMMZ 70516) in moist vegetation near a small spring fed pool. A third specimen (UK 13,161, a juvenile) was taken the following year by Taylor (Univ. Kans. Sci. Bull., vol. 23, 1935, pp. 358-363, pl. 30, figs. 58, 59) from a pile of moist drift at the edge of Black River about 2 miles south from the entrance of Carlsbad Cavern (elevation about 4400 feet) in Eddy County, New Mexico. Both Taylor and Mosauer referred their skinks to the Mexican species, *Eumeces humilis* Boulenger.

In 1942 Smith (Proc. New England Zool. Club, vol. 21, 1942, pp. 93-95) pointed out that the three extant Pecos skinks differed in a number of respects from the Mexican *Eumeces humilis* Boulenger. He concluded that they represented an undescribed species which he named *Eumeces taylori*. The adult female from Frijole was designated as the type of the new species.

No additional specimens were reported in the literature until late in 1951 when Bundy (Copeia, no. 4, 1951, p. 314) reported a fourth Pecos Skink "caught on a cloudy cool afternoon in grass a few miles southwest of Roswell," Chaves County, New Mexico (elevation about 4000 feet). Mr. Bundy kindly informs me in correspondence that it has been deposited in the Museum of the New Mexico Military Institute and was collected on August 15, 1950 at Six Mile Hill, six miles southwest of Roswell on a sandy substrate with no moisture evident.

The fifth Pecos Skink was among the reptiles and amphibians collected for the University of Michigan Museum of Zoology by Robert R. Miller and Howard E. Winn in the Southwest during the spring of 1950. It was shot on the morning of March 4th near a small mound adjacent to the large pool at the hot sulphur spring 2 miles south of Leon Springs. This locality, 8 miles west of Fort Stockton, Pecos County, Texas is approximately 150 miles southeast of the nearest recorded occurrence (the type locality). A second skink, presumed to be of this species, was seen to enter a small burrow in the same mound. A number of these burrows were noted indicating that these lizards regularly inhabit the mound.

Pecos County generally is an arid, level to rolling dissected plain of moderate elevation. The nearest mountains, the Davis and Glass, are some thirty miles west and southwest of Leon Springs. The vegetation is sparse and consists mostly of creosote (*Larrea divaricata*) and tarbush (*Flourensia cernua*) with some tuscock (*Sporobolus airoides*), burro

(*Scleropogon brevifolius*), and salt grass (*Distichlis texana*). The general vicinity of Leon Springs (elevation less than 3000 feet) is a flat plain broken with a few mesas but none closer than about 10 miles. This habitat is totally unlike that reported for the other specimens; it is at a lower altitude, much less humid, away from mountains (particularly the Guadalupes where all the other specimens were found), and adjacent to a hot sulphur water spring.

This specimen of *Eumeces taylori* (UMMZ 105126, a male) has been compared with the type specimen. It agrees well with the type except that the parietal is narrowly enclosed by the interparietals posteriorly and followed by a pair of large jubals. In the type the parietal separates the interparietal and the jubals are only slightly enlarged. The total length is 178 mm., snout to vent 60 mm.; adpressed limbs not overlapping, the longest toe separated from the longest finger by 10 scales. There is a single postnasal; two post mentals; twenty-four scales around midbody; 59 scales from interparietals to posterior edge of thighs; prefrontals broadly in contact.

STRECKER MUSEUM, BAYLOR UNIVERSITY, WACO, TEXAS

SOME OBSERVATIONS ON THE MANGROVE SNAKE IN CAPTIVITY—The following observations, although on one specimen and therefore somewhat limited in scope, are presented in the hope that they may fill some gaps in our knowledge of the Mangrove Snake (*Boiga dendrophilus*). They deal with a six-foot male of the species kept in captivity for seven and one-half months. The snake was acquired on January 5, 1951, and was disposed of, still in good health, on August 27 of the same year.

Growth and Skin Shedding. The snake was measured one month after arrival and found to be sixty inches long and four and one-half inches in circumference. By the next month it had eaten two mice, a hamster and a full sized rat and its length was about sixty-seven inches. By the next month it had eaten only one mouse and one rat and showed a correspondingly slower growth rate of two inches. In the course of the next two months the snake ate six mice and six rats and increased two more inches in length, the girth remaining the same. In the following two and one-half months the sustained lowness of temperature (the cage averaged about 70 degrees F.) cut the feeding to one mouse, and no growth was recorded, the snake getting progressively thinner. From the first to the fifth month it grew approximately eleven inches and shed the skin four times, twice in one piece. In the two and one-half months that followed, one moult occurred and no growth took place. After appearance of the first signs of moulting, completion of the process required 8, 9, 9, and 10 days; one shedding which was incompletely observed is omitted from this count. The snake had a scar on his neck which, although not open, could conceivably have contributed to the frequency of its sheddings, for five sheddings in seven and one-half months would seem to be a rather high rate.

Feeding. For the first five months the snake fed readily, but only in darkness and only on mammals or birds. Size of prey ranged from very small mice to full-sized white rats. The latter approached the maximum size limit of prey, as the snake found difficulty in killing the rats, and

took a very long time to swallow them. In all cases the method of attack was the same: upon darkening of the room or, if the cage was already dark, immediately upon introduction of the food, the snake would immediately become alert and start cruising about the cage. Once it perceived the prey it would approach cautiously and then strike quickly, seizing the animal with a chewing motion in order to use the fangs; at the same time the snake would draw the prey into its coils. At all times the mouse or rat died quickly, the time required for death depending directly upon the size of the prey and almost never exceeding five minutes. The snake's coils seemed to be the important killing agent, for the prey almost always seemed to be dying of strangulation and twice when it escaped, once to live on for more than a month, it survived strikes which tore the fur and were amply well delivered to inject the venom.

For ready acceptance of food the temperature had to be kept quite high, at no less than perhaps 76 degrees F. However, when feeding well, food was taken at as low a temperature as 72 degrees F. Maintenance of temperature as low as about 73 degrees F. for a week or so caused the snake to go into a state of lethargy from which even a temperature briefly as high as 81 degrees did not arouse it. During this state of semi-hibernation it did not feed, but was totally inactive, even at night. Restoration of a prevailing temperature of 78 degrees F. resulted in resumption of feeding, and activity was maintained thereafter even during brief periods of considerably lower temperatures.

Disposition. In the seven months the snake was in my possession it was never really tame and never showed signs of becoming tamer, although it did not object to handling of a respectful nature. There was a limit of endurance beyond which the snake would strike and bite no matter how accustomed it was to handling. It always seemed calm and became quickly quiet upon release, never striking hysterically at anything within reach as is the custom of so many snakes once enraged. For this reason, when shown a retreat this snake would cease trying to bite and shoot into the refuge, definitely recognizing the offer of safety and darkness. Only if surprised in some manner just after being fed would it alter that behavior; in such cases the snake would strike out fiercely, often at his refuge before it recognized it. It seemed more irritable at night than in the daytime, a fact which could probably be attributed to nocturnal habits.—JOHN PAUL BARACH, 35 E. 84th Street, New York City.

A New Salamander from the Everglades of Southern Florida

By H. W. PETERSON

Several series of *Diemictylus viridescens* collected at various localities in the Everglades area of Florida have shown significant differences from the northern race, *D. v. louisianensis*. No name or characterization of the more southern form, here regarded as a distinct subspecies, has ever appeared. It is accordingly here designated as

Diemictylus viridescens evergladensis, new subspecies

Holotype. UIMNH 28740, adult aquatic male, from 60 mi. W Miami, on U. S. Highway 94, Monroe Co., Florida, April 13, 1952, by H. W. Peterson.

Paratypes. Fifty-seven, including 4 topotypes (UIMNH 28738-9, 28741-2), 35 (UIMNH 28743-7, 30000-29) from 26 mi. W Miami, Rte. 41, Dade Co., by H. W. Peterson, and 18 (UIMNH 28748-65) from 12.6 mi. W Miami, Rte. 41, Dade Co., Florida, by William R. Johnson and H. W. Peterson.

Diagnosis. A heavily pigmented newt related to *D. v. louisianensis,* having in the aquatic adult stage a greater number of ventral black specks and a dark brown to blackish-brown ground color; cranial crests which often converge posteriorly; and a slightly granular skin.

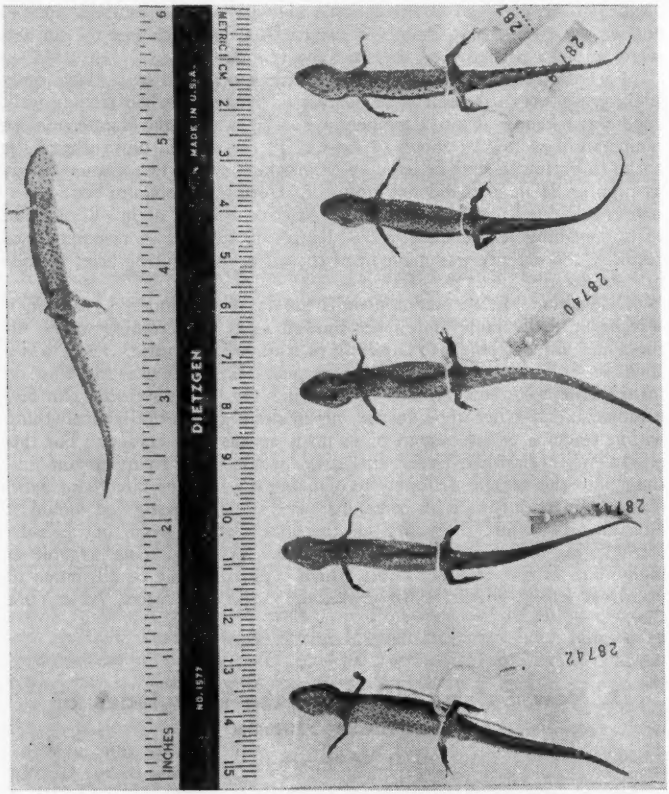

FIG. 1. Ventral views of a series of paratypes of *Diemictylus viridescens evergladensis,* all topotypes.

Description of holotype. Head narrow, snout bluntly pointed; head widest at angle of jaw; cranial crests prominent, convergent posteriorly; gular fold absent; three pits on sides of head, level with and behind eye. Skin soft, somewhat granular; costal grooves not evident. Fingers, 1-4-2-3 in order of increasing length, toes, 5-1-2-4-3. Dorsal keel on tail slight. Vent large and protuberant, with many thread-like papillae.

Snout to vent, 35.5 mm.; tail 38 mm. + (about 2 mm. lost from tip of tail); foreleg from axilla, 12 mm.; hind leg from groin, 11.5 mm.; head length, 9 mm. (to rear corner of skull).

General ground color dark brown to blackish-brown, the color extending to a sharply defined line just above limbs. Ventral surface uniformly cream or pale yellow, with a great number of black specks, approximately three times or more the number found in *louisianensis*. Dorsal and lateral surfaces spotted, dimly except on sides of tail. In life, small red spots in a broken dorsolateral series and eye with a golden, black-flecked iris.

Variation. The cranial crests vary somewhat in degree of convergence, sometimes being virtually parallel; gular fold sometimes evident, although poorly developed; sometimes only one or two temporal pits, particularly in smaller individuals, no temporal pits in females; granulation of skin accentuated by preservation, but extraordinarily well-developed in live aquatic adults; tail length averaging about 52% of total length in males, 53% in females; dorsal keel on tail poorly developed in all; vent of female smaller than in males, with slight convolutions on lateral surfaces.

Females of a lighter ground color, with a brighter spotting.

Range. It is presumed that this race is restricted to the Everglades. How far south it may occur is not known. Samples of newts from areas adjoining the northern edge of the Everglades are typical *D. v. louisianensis*.

Comparisons. Available for comparison with *D. v. evergladensis* were series of *D. v. louisianensis* from Oklahoma (10), Texas (31), Illinois (4), Indiana (1), Wisconsin (3), and various localities in Florida (Alachua Co., 59; Jackson Co., 1; Osceola Co., 1; and Glades Co., 15). The southernmost specimens (Glades Co.: Bridge 25, Route 25), taken but a few miles north of the Everglades, are clearly referable to *D. v. louisianensis* despite geographic proximity of the site of their provenance to localities of known occurrence of *D. v. evergladensis*.

The chief difference between the two races appears to be the much greater degree of spotting on the venter in *D. v. evergladensis;* this is shown in the accompanying plate. Occasional specimens of the northern subspecies approximate the condition typical in the southern race, but a difference is evident even in such extremes. Most individuals of *D. v. louisianensis* are much less spotted than the Everglades race, and are separable at a glance. No ready means has been devised, unfortunately, to place the difference on an objective basis.

The southern race appears to attain a larger size, as commonly specimens close to or even exceeding the maximum for *D. v. louisianensis* are taken.

Certain phases of life history are probably different. Despite extensive work, no red efts were ever found of *D. v. evergladensis*. A number of characters of the adults—the granular skin, persistent gular fold, dark coloration, poorly developed caudal fin, persistent gill vestiges—suggest that transformation has been direct from the larval to the aquatic adult

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stage. Retention of certain juvenile characters is to be expected under such circumstances. Condition of the cloaca suggests sexual maturity of most individuals. It may be noted that the habitat seems scarcely adequate for support of a red eft stage in the life cycle.

Remarks. Food in captivity consisted of *Daphnia,* newly-born mosquita fish, *Cyclops, Spirogyra*-like algae, and a variety of small insects and insect larvae.

I am grateful to Mr. William R. Johnson and Mr. John P. Lantz for assistance with field work.

MUSEUM OF NATURAL HISTORY, UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS

INTERESTING HABITS OF *HYLA DOMINICENSIS*—The author has discovered that burrowing is a commonplace habit of the giant tree frog: *Hyla dominicensis.* Some specimens that were caught by H. W. Peterson, Ronald Garrett and the author while on a collecting trip in the Florida Keys during late April, 1952, exhibited several forms of burrowing when placed in terraria.

In one terrarium, some burrowed in the moist sand to a depth of 1½ inches. In another quite large terrarium, some burrowed in the loose dirt until they were covered by approximately ⅛ inch of dirt; others concealed themselves under a piece of wood; while others burrowed only partially, keeping the head uncovered.

Mr. E. T. Willis, Jr. has informed me that while collecting in Victoria de la Tunas, Cuba, during late May and early June, 1952, he found several *Hyla dominicensis* under boards and concealed in holes. —JOHN PERRY LANTZ, Box 793, University of Miami, Miami, Florida.

RANA GRYLIO FROM THE PLEISTOCENE OF FLORIDA—Among specimens recently collected from the Pleistocene of Florida by Dr. Pierce Brodkorb and Dr. Coleman J. Goin, of the Department of Biology of the University of Florida, are a few individual bones belonging to the genus *Rana*. These originated from the Haile Pit, Section 24, Township 9 S, Range 18 E, about four miles northeast of Newberry, Alachua County, Florida. Doctors Brodkorb and Goin have allowed me to examine these specimens, and have kindly provided information concerning the geology of the deposit from which they were taken.

This deposit consists of unconsolidated Pleistocene sands washed into cavities in the underlying Eocene limestone. Exact dating in the Pleistocene is impossible, but since the altitude of Newberry is 83.5 feet above sea level, this locality would lie between the Wicomico and Penholoway Terraces, considered to have been formed during the Sangamon interglacial. It must be assumed, therefore, that the fossils are of Sangamon or later origin.

Although the majority of specimens might equally well represent any one of several species, one sacral vertebra can be referred to *Rana grylio* with a very high degree of certainty, and a similar identification for the distal portion of a humerus is highly probable. None of the other specimens are inconsistent with a tentative identification as belonging to this species, although it is by no means impossible that some other form is also represented. A surprisingly high proportion of the specimens must represent individuals with a snout-vent length of 150 mm. or more.

The occurrence of *Rana grylio* in this part of Florida during the Sangamon (or later) is not in the least unexpected. But our almost complete lack of knowledge, other than by inference, of the Pleistocene distribution of American Salientia makes it desirable at present to place on record any occurrence of Pleistocene forms that can be specifically identified.—J. A. TIHEN, Harper, Kansas.

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INTERSPECIFIC MATING BEHAVIOUR IN *RANA AURORA* AND *RANA CATESBEIANA*—On February 25, 1952, at about 8:30 p.m., Mr. Wallace Girts and Mr. Calvin Giesler collected an amplectic pair of what appeared to be *Rana aurora.* Closer examination revealed that although the frog in the male position was of this species, the lower frog was a medium-sized (snout-vent length—71 mm.) male bullfrog. The frogs broke apart during handling and it was noted at that time that the bullfrog exhibited two separate abrasions on its pectoral region at points where the forefeet of the red-legged frog were held during amplexus. Later examination showed these wounds to have penetrated to subdermal muscle and to be located just anterior and lateral to the xiphisternal area. They averaged about 3 mm. in length.

During transit from the collecting area, amplexus was resumed and the frogs then retained this connection in a filled aquarium until some time on February 29. The depth of the abrasions and the continued amplexus after capture indicate that this was no transitory event. It is probable that the drive to maintain the mating position existed only in the *Rana aurora.* However, the bullfrog rested rather passively in the aquarium except when disturbed by observers. The size of the bullfrog is comparable with that of breeding *Rana aurora* females, and one must assume that other of its characteristics either satisfied instinctive drives in the red-legged frog or at least did not disrupt the usual inherent mating pattern.

Since the bullfrog is an introduced species in western Oregon, this case would seem to be an interesting example of the lack of development of isolating mechanisms in widely separated species.—ROBERT M. STORM, Zoology Dept., Oregon State College, Corvallis, Oregon.

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